

EOSDIS Core System Project

Interface Control Document Between EOSDIS Core System (ECS) and the Landsat 7 System

Revision A

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Interface Control Document
between EOSDIS Core System (ECS)
and Landsat 7 System

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision. This document contains information pertaining to ECS Release B.

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Abstract

This Interface Control Document (ICD) defines the functional and physical design of system interfaces between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and the Landsat 7 System.

This ICD presents the interface definition for the system interfaces between ECS Release B and the Landsat 7 System. These interfaces include the full system interface between ECS and LPS; the system interfaces between ECS and the Landsat 7 Image Assessment System (IAS), the Landsat 7 Mission Management Office (MMO), and the Landsat 7 International Ground Stations (IGSs); and specific interface definitions required to support access to Landsat 7 directory, guide, and inventory information. The IAS provides calibration parameter files to ECS. The MMO and ECS exchange system management status, product price information, as well as statistics and reports. The Landsat 7 IGSs provide IGS metadata and browse to ECS. ECS provides user access to Landsat 7 directory, guide and inventory information.

It is important to note that this ICD does not explicitly define ECS user interfaces. User interfaces are addressed within this ICD for informational purposes only---i.e., as registered ECS users, both the Landsat 7 Mission Operations Center (MOC) and the IAS interface routinely with ECS Release B in order to acquire their requisite data.

This ICD is consistent with the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS Level 3 requirements) and the Interface Requirement Document (IRD) Between EODIS and the Landsat 7 System.

Keywords: EDC, handshaking, IAS, ICD, IGS, interface, Landsat-7, Level0R, LPS, MMO, MOC, ODL, PVL

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Appendix C. Level 0R Metadata Parameter Checking and Search Criteria

Abbreviations and Acronyms

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1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirement List (CDRL) item 029, whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Scope

The ECS-Landsat 7 ICD provides definition for the system interfaces between Release B and the Landsat 7 System. The system interfaces between ECS and LPS support early interface testing as well as Landsat 7 operations. This ICD does not explicitly define ECS user interfaces. User interfaces with ECS to acquire Landsat 7 data are described herein for informational purposes only.

The Earth Science Data and Information System (ESDIS) Project has responsibility for the development and maintenance of this ICD with support from Landsat 7. Any changes in the interface definition must be agreed to by the relevant participating parties, and then assessed at the ESDIS Project Level. This ICD is approved under the signatures of the ESDIS and Landsat 7 Project Managers.

ECS Releases are keyed to mission support: Release B provides support to EOS AM-1 Mission Operations and Science Operations, and it provides support to ESDIS Ground System Certification Testing for the EOS AM-1 and Landsat 7 missions. Early ECS/L7 interface testing is supported by the pre-Release B Testbed. Release B also provides archive and distribution services for the Landsat 7 mission. Table 1-1 provides a mapping of ECS functionality to Landsat 7 interfaces for the newly defined Releases B.0 and B.1. Releases C & D provide evolutionary enhancements to the ECS services provided in the earlier Releases.

This ICD presents the definition of the full ECS Release B-Landsat 7 system interfaces which support transfer, ingest, archive and distribution of Landsat 7 Level 0R data and calibration parameters, transfer of international ground station (IGS) metadata and browse, transfer of product price information and system management status, and access to Landsat 7 directory and guide information.

Table 1-1. Mapping of ECS Functionality to Landsat-7 Interface by Releases B.0 and B.1 (1 of 2)

ECS Functions	L7 Non-User Elements					L7 User Elem*		Remarks
	LPS	IGS	IAS	MMO	MOC	IAS	MOC	
Ingest								
automated network ingest, DAN	B.0							
polling ingest without PDR					TBR (1)			(1) Considering Polling w/o PDR.
polling ingest with PDR		B.0	B.0		TBR (2)			(2) Considering Polling with PDR.
interactive network ingest								
hard media ingest		B.1						Browse will be provided by IGSs in B.1
ingest media check-in		B.1						
Mgt. Subsystem								
billing & accounting				B.1				Workaround exists in B.0 using existing EDC mechanisms.
accountability reports				B.1				
fault management reports				B.1				
network performance rpts								
system performance reports				B.1				
security mgt notifications								
CSS/IDG								
WWW				B.1				
e-mail	B.0	B.0	B.0	B.0	TBR (3)	B.0*	B.0*	(3) Evaluating use of e-mail.
ECS bulletin board								
DCE client								
soft authentication	B.0	B.0	B.0	B.0		B.0*	B.0*	
Kerberos								
ftp		B.0	B.0		TBR	B.0*	B.0*	
sockets/DCE Gateway	B.0							
Document Data Server								
store documents			B.1					
Insert guide metadata & reports	B.1	B.1	B.1					A Web server will be provided for this purpose in B.0.
submit subscriptions				B.1				
delete subscriptions				B.1				
provide access to stored documents				B.1				
distribute documents via subscriptions				B.1				
guide search								

Table 1-1. Mapping of ECS Functionality to Landsat-7 Interface by Releases B.0 and B.1 (2 of 2)

ECS Functions	L7 Non-User Elements					L7 User Elem*		Remarks
	LPS	IGS	IAS	MMO	MOC	IAS	MOC	
Science Data Server								
subscription (user)						B.1*	B.1*	
product order						B.0*	B.0*	
order status						B.0*	B.0*	
product order cancellation						B.0*	B.0*	
metadata update			B.0					
distribution notice						B.0*	B.0*	
SDSRV performance reporting				B.1		B.1*	B.1*	
ESDTs	B.0	B.0	B.0	B.0	TBR			

* Note: ECS Standard User Interface is not the topic of the L7/ECS ICD---it is discussed for information purposes only.

This document reflects the technical baseline, maintained by the ECS Configuration Control Board in accordance with the ECS technical direction (see Section 2.2).

1.3 Purpose

This document is written to formalize the interpretation and general understanding of the interfaces between ECS and the Landsat 7 System. These interfaces exist in order to allow transfer of Landsat 7 Level 0R data, associated data, and information to ECS for data archive and for distribution of Landsat 7 products to users directly from ECS. This document provides clarification and elaboration of the ECS-Landsat 7 interfaces to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of system interface definitions for the ESDIS and Landsat 7 Project Configuration Control Boards (CCBs).

1.4 Status and Schedule

The ECS Release B is the final version of this ICD. In general, within this document are some interfaces that have associated To Be Determined (TBD), To Be Resolved (TBR), and/or To Be Supplied (TBS) items. A Work-Off Plan is provided in Appendix A for resolving open items. This plan provides the following information:

- ICD I/F Issue Number
- ICD Reference Paragraph
- ICD Issue Priority
- ICD Issue Type - Description

- e. Work-off Plan Task(s)
- f. Projected Resolution Date
- g. Risk Assessment

1.5 Organization

This document is organized in 5 sections plus appendices. Section 2 contains information about documentation relevant to this ICD, including parent, applicable, and information documents. Section 3 provides an overview of the ECS-Landsat 7 interfaces, with a brief description of the interfaces involved. Section 4 provides an overview of the data exchange framework. Section 5 contains a description of ECS-Landsat 7 data flows, including data format and content, the data transfer method(s), and error handling. Appendix A provides the Work-Off Plan supporting resolution of issues and closures of TBD, TBR and/or TBS items. Appendix B provides a description of Landsat 7 products for distribution to ECS users, including Landsat 7 elements that order data from ECS. Appendix C provides the data which has been identified for Level 0R metadata parameter checking and search criteria. Acronyms and abbreviations are included in Appendix AB.

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content are derived.

301-CD-002-003	System Implementation Plan for the ECS Project
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
430-L-0002-A	Goddard Space Flight Center, Landsat 7 System Specification
505-41-13	Goddard Space Flight Center, Interface Requirements Document Between Earth Observing System Data and Information System (EOSDIS) and the Landsat 7 System
560-8FPS/0194	Goddard Space Flight Center, Landsat 7 Processing System (LPS) Functional and Performance Specification
none	Goddard Space Flight Center, Landsat 7 System, Image Assessment System Element Specification [ref. December 19, 1994]
none	Goddard Space Flight Center, Inter-project Agreement between the Landsat Project and the Earth Data and Information System Project for the Landsat 7 System

2.2 Applicable Documents

The following documents (or in some cases, Internet links to documents/information), are referenced herein and are directly applicable to this document to the extent of the reference. In the event of conflict between any of these documents and this document, this document shall take precedence. Internet links cannot be guaranteed for accuracy or currency.

209-CD-001-003	Interface Control Document Between ECS and the NASA Science Internet (NSI)
224-CD-001-001	Release B Release Plan for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification for the ECS Project

305-CD-022-002	Release B SDPS Interoperability Subsystem Design Specification for the ECS Project
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communication Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS System Management Subsystem Design Specification for the ECS Project
305-CD-033-002	Release B EDC DAAC Design Specification for the ECS Project
305-CD-038-002	Release B System Management Center (SMC) Design Specification for the ECS Project
311-CD-002-004	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
311-CD-003-005	Communications and System Management Segment (CSMS) Database Design and Database Schema Specifications for the ECS Project
210-TP-001-006	Technical Baseline for the ECS Project
430-11-06-009	Goddard Space Flight Center, Landsat 7 to International Ground Station (IGS) Interface Control Document, 1/31/97
430-15-01-002-0	Goddard Space Flight Center, Landsat 7 Calibration Parameter File Definition
510-3FCD/0195	Goddard Space Flight Center, Landsat 7 Processing System (LPS) Output Files Data Format Control Book (DFCB)
540-097	Goddard Space Flight Center, Interface Control Document Between the EOSDIS Backbone Network (EBnet) and the Landsat 7 Processing System (LPS)
560-8SDS/0194	Goddard Space Flight Center, Landsat 7 Processing System (LPS) System Design Specification
none	Goddard Space Flight Center, ECS Technical Direction No. 11, "PDR Technical Baseline," 12/6/94
RFC 791	Internet Protocol, J. Postel (WWW access: gopher://ds.internic.net:70/)
RFC 793	Transmission Control Protocol, J. Postel (WWW access: gopher://ds.internic.net:70/)

RFC 821	Simple Mail Transfer Protocol (SMTP) (WWW access: gopher://ds.internic.net:70/)
RFC 822	Standard for the Format of Advanced Research Project Agency (ARPA) Internet Text Messages, D. Crocker (WWW access: gopher://ds.internic.net:70/)
RFC 959	File Transfer Protocol, Internet Standards, J. Postel, J. Reynolds (WWW access: gopher://ds.internic.net:70/)
none	HyperText Markup Language Specification Version 3.0, Internet Draft, D. Raggett (WWW access: gopher://ds.internic.net:70/)
none	HyperText Transfer Protocol Version 1.0, Internet Draft, T. Berners-Lee, R. Fielding, H. Frystyk (WWW access: gopher://ds.internic.net:70/)

2.3 Information Documents

The following documents (or in some cases, Internet links to documents/information), although not directly applicable, amplify or clarify the information presented in this document, but are not binding. Internet links cannot be guaranteed for accuracy or currency.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project
205-CD-001-002	Science User's Guide and Operations Procedure Handbook for the ECS Project, Parts 1-3
193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002-003	Operations Concept for the ECS project: Part 2B -- ECS Release B
170-TP-005-002	HDF-EOS Library User's Guide for the ECS Project, Volume 1: Overview and Examples
170-TP-006-001	HDF-EOS Library Users Guide for the ECS Project, Volume 2: Function Reference Guide
430-11-06-007-0	Landsat 7 OR Distribution Product Data Format Control Book, Volume 5
560-203.103	Goddard Space Flight Center, Interface Control Document Between the Sensor Data Processing Facility (SDPF) and the Tropical Rainfall Measuring Mission (TRMM) Consumers
560-3OCD/0194	Goddard Space Flight Center, The LPS Operations Concept

23007702-IV	Goddard Space Flight Center, Landsat 7 Data Format Control Book (DFCB) Volume IV - Wideband Data, Revision C, April 1996
CCSDS 641.0-B-1	Consultative Committee for Space Data Systems (CCSDS), Recommendation for Space Data System Standards: PVLSPEC - Parameter Value Language Specification, 5/92 (WWW access to CCSDS Documents Library: http://ddwilson.gsfc.nasa.gov/CCSDS-A.html (request a keyword search on "PVL"))
CCSDS 641.0-G-1	Consultative Committee for Space Data Systems (CCSDS), Report Concerning Space Data System Standards, Parameter Value Language - A Tutorial, Green Book (WWW access to CCSDS Documents Library: http://ddwilson.gsfc.nasa.gov/CCSDS-A.html (request a keyword search on "PVL"))
none	Internet Programming, Jamsa Kris, Ph.D., and Cope, Ken; Jamsa Press, Nevada, 1995

3. Interface Overview

Landsat 7 and ECS work together to provide user access to data collected by the Enhanced Thematic Mapper Plus (ETM+) instrument flown on the Landsat 7 satellite. The Landsat 7 Project processes the raw instrument data into Level 0R data and then provides the data to ECS for ingest, archive and distribution. All ECS registered users are permitted access to Landsat 7 Level 0R data, metadata and browse data archived by ECS.

The Landsat 7 Program provides a satellite remote sensing capability serving a broad community of users, including those involved in global change research as well as civil, national security, academic, and commercial applications. A primary goal of the Landsat 7 System is to acquire and periodically refresh global, substantially cloud-free data of all sun-lit land masses.

The Landsat 7 satellite is scheduled for launch in 1998 and is planned to operate for a minimum of five years. The ETM+ instrument on the satellite performs multispectral imaging. Data is downlinked via direct X-band interfaces to the Landsat 7 Ground System at the Earth Resources Observation System (EROS) Data Center (EDC), Sioux Falls, South Dakota. There, the raw data is processed into Level 0R format-specific subinterval data files and transferred to ECS via a direct link between the Landsat 7 Processing System to ECS at EDC. Other data and information exchanged between ECS and the other Landsat 7 system elements are transferred via Internet interfaces or by physical media.

ECS support for the Landsat 7 science data is collocated with the Landsat 7 Ground System at EDC. ECS at the EDC Distributed Active Archive Center (DAAC) provides: ingest of and long-term storage for Landsat 7 image data sets and calibration parameter files; EOSDIS user access to Landsat 7 browse images and a catalog of archived Landsat 7 data for data search and product order; science data subsetting and distribution of products in response to orders.

Figure 3-1 provides a top-level view of the ECS-Landsat 7 interfaces. These interfaces show both system interfaces supporting required data flows and user interfaces for acquisition of Landsat 7 products. The ECS-Landsat 7 data exchange and user data access are supported by communication/networking services through ECS, the EOSDIS Backbone Network (EBnet), the EDC Exchange LAN, and Internet.

Landsat 7 elements exchanging data and information with ECS are the Landsat 7 Processing System (LPS), the Image Assessment System (IAS), the Mission Management Office (MMO), and the International Ground Stations (IGSs). The first three of these elements belong to the Landsat 7 Ground System (note: MMO functions are provided through NOAA, the National Oceanic and Atmospheric Administration). The IGSs, which are geographically dispersed, receive downlinked Landsat 7 data via their own direct X-band interface and provide to ECS only inventory metadata (i.e., information needed for recognizing and retrieving specific granules comprising a data set) and browse data corresponding to the Landsat 7 image data they

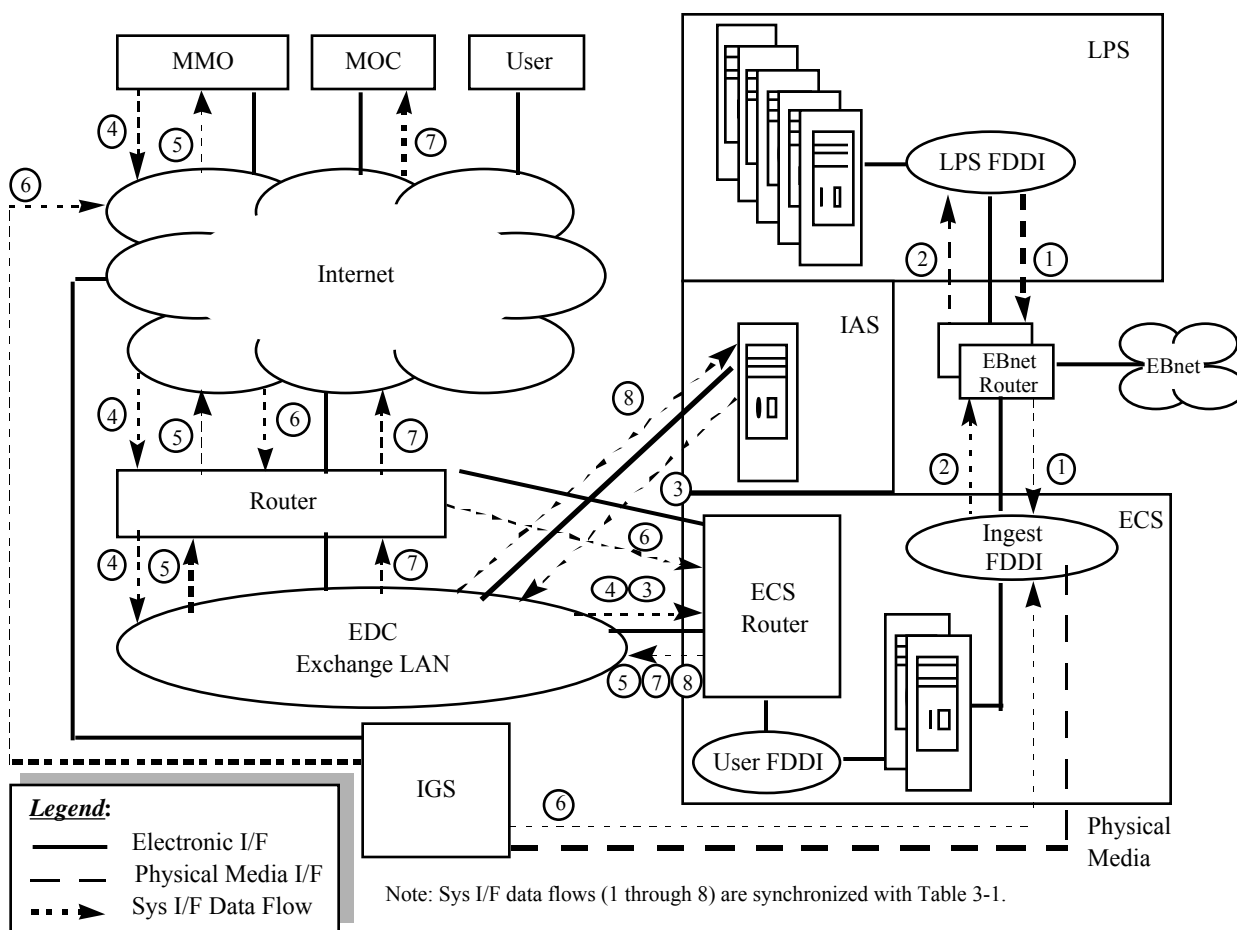


Figure 3-1. ECS-Landsat 7 Interface Overview

acquire. The Landsat 7 Mission Operations Center (MOC) provides engineering data to ECS and also interfaces with ECS as a routine user to acquire Landsat 7 metadata. The Landsat 7 IAS also interfaces with ECS as a routine user to acquire Level 0R image data.

3.1 ECS-Landsat 7 System Interfaces

System interfaces between Landsat 7 and ECS provide the means for transferring Landsat 7 data and for sending messages supporting data transfer. Additionally, these interfaces support exchange of information concerning system status, user activity, product pricing, directory and guide information.

The Landsat 7 elements which have system interfaces to ECS are: the LPS, IAS, MMO, MOC, and the IGSs. Table 3-1 provides a list of the ECS-Landsat 7 system interface data flows, identifying source and destination for each flow. These interfaces are fully supported by ECS

Release B. Early interface tests performed with the pre-Release B Testbed verify ability to transfer messages and test data files between LPS and ECS.

The interfaces listed in Table 3-1 are described within this ICD to support ECS and Landsat 7 design and test activities. Interface operations are described within the ECS Operations Concept Documents listed in Section 2.3.

Table 3-1. ECS-Landsat 7 System External Interfaces

Number (Note 1)	Source	Destination	System Interface Data Flows	ECS Release Applicability
1	LPS	ECS	Data Availability Notice Level 0R Data Level 0R Inventory Metadata Level 0R Browse	pre-Rel B Testbed- Fully met pre-Rel B Testbed - Partially met/B - Fully met pre-Rel B Testbed - Partially met/B - Fully met pre-Rel B Testbed - Partially met/B - Fully met
2	ECS	LPS	Acknowledgment	pre-Rel B Testbed- Fully met
3	IAS	ECS	Calibration Parameters with Metadata Update	Release B - Fully met
4	MMO	ECS	Product Price Information System Management Status	Release B - Fully met Release B - Fully met
5	ECS	MMO	System Management Status Statistics and Reports	Release B - Fully met Release B - Fully met
6	IGSs	ECS	IGS Inventory Metadata IGS Browse	Release B - Fully met Release B - Fully met
7	ECS	MOC	Level 0R Inventory Metadata	Release B - Fully met
8	ECS	IAS	Level 0R Products	Release B - Fully met
(Note 2)	L7	ECS (Document Data Server)	Landsat 7 Guide Information & IAS Reports	Release B - Fully Met

Note 1: System Interface data flows (1 through 8) are synchronized with Figure 3-1

Note 2: L7 independent data flow (outside of ECS-L7 interface); not depicted in Fig 3-1.

3.2 Landsat 7 User Interfaces

This description is provided for informational purposes only and is not meant to define Landsat 7 user interfaces to ECS.

ECS Release B will be capable of distributing up to fifty-eight gigabytes (58 GB) of Landsat 7 data products during a single day (55 GB of image data and 3 GB of non-image data). All ECS registered users are permitted access to Landsat 7 Level 0R data archived by ECS. The Landsat 7 IAS and MOC elements will interface with the EDC DAAC as registered ECS users to acquire their requisite Level 0R products through normal user operational interfaces. Landsat 7 product distributions to the IAS and MOC are expected to be ten percent or less of the maximum daily distribution volume. Appendix B provides a description of the Landsat 7 data products available for order. Landsat 7 products include subintervals, scenes, partial subintervals (i.e., floating block), and non-image data products.

User interfaces require human interaction with ECS for data query and selection. Figure 3-2 illustrates the routine user interfaces for query and acquisition of ECS-archived Landsat 7 data (see Figure 5-1 for data flows between ECS and the Landsat 7 Non-user elements). Users may query the archived data by specific search criteria, view Landsat 7 scene-based browse images and metadata representing the query results, and order Level 0R products for distribution electronically or on physical media. Prior to placing an order, users may request and receive a price estimate for the requested products. After placing an order, users may contact ECS by phone, e-mail, or normal user operational interfaces for product order status.

In addition, through an Internet interface, users have access to the Landsat 7 Guide Information which is resident in the ECS Document Data Server.

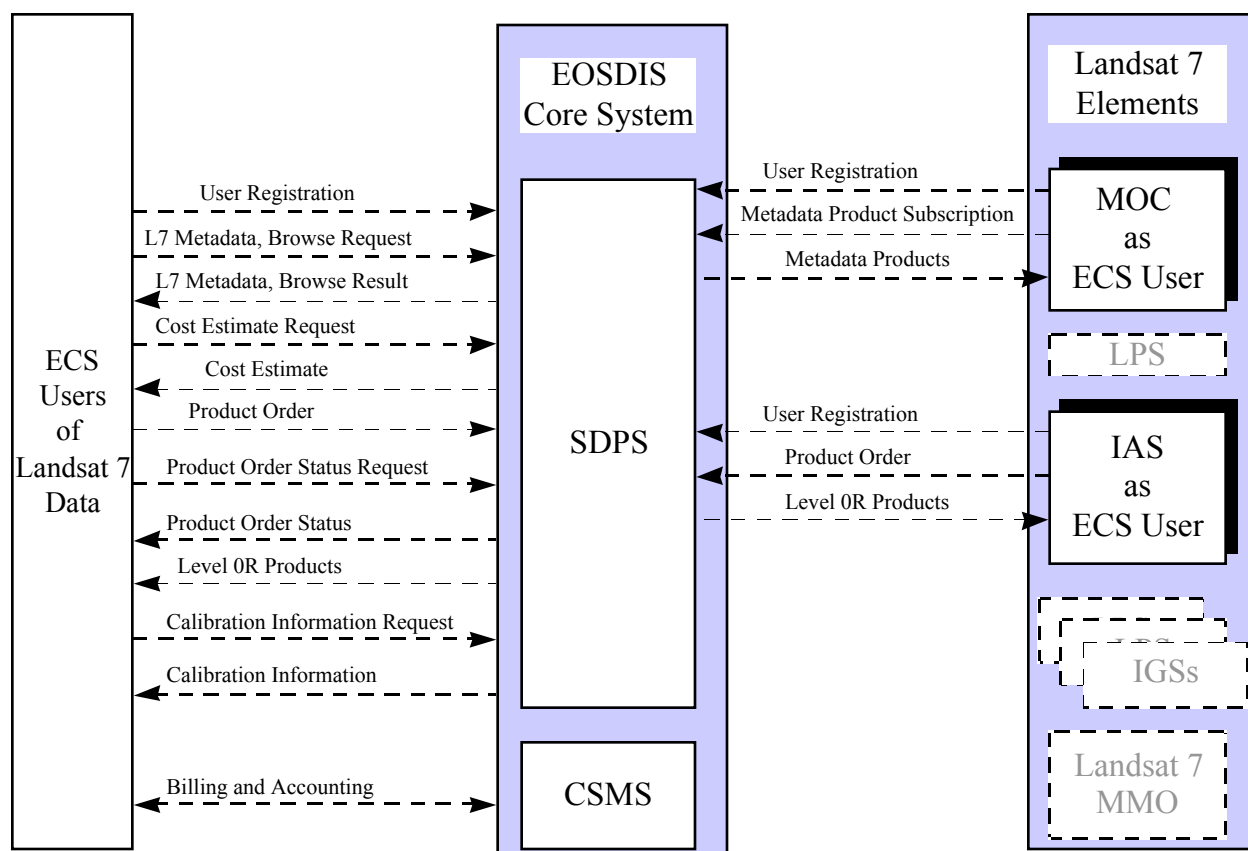


Figure 3-2. Landsat 7 User Interfaces

3.2.1 IAS Acquisition of Image Data

This description is provided for informational purposes only and is not meant to define Landsat 7 user interfaces to ECS.

In addition to providing calibration coefficients for archived Level 0R data, the IAS has the responsibility to evaluate the quality of the ETM+ instrument. For this evaluation process, the IAS normally orders up to 10 scenes of Landsat 7 data per day from ECS---this is above and beyond the 100 scenes/day maximum daily distribution. The IAS order may include any combination of available Landsat 7 image and non-image products. The daily data flow from ECS to IAS is not expected to exceed 5 GB.

For data acquisition from ECS, the IAS accesses ECS through the EDC Exchange LAN interface and registers as an ECS user. After registration, an IAS user may access Landsat 7 metadata and browse to select desired Landsat 7 products. The IAS user places an order for selected products. ECS processes the order and stages the requested data product(s) for IAS transfer over the EDC Exchange LAN. The IAS may instead request a media distribution for the order. User registration, search and ordering procedures will be provided in the update to the Science User's Guide and Operations Procedure Handbook for the ECS Project, 205-CD-001-002, pending the delivery of Release B.

3.2.2 MOC Subscription for Metadata

This description is provided for informational purposes only and is not meant to define Landsat 7 user interfaces to ECS.

The MOC has the responsibility to assess the cloud coverage of the Landsat 7 image data in order to determine if ETM+ acquisitions need to be repeated. These assessments are based on the cloud cover assessment (CCA) data that is part of the Level 0R metadata files delivered to ECS by LPS with each subinterval. The MOC, as an ECS registered user, periodically acquires Landsat 7 metadata files, which include the CCA data, to perform the cloud coverage assessment. The daily data transfer of metadata from ECS to the MOC is not expected to exceed one megabyte (MB).

The MOC accesses ECS via an Internet interface and registers as an ECS user. As a registered ECS user, the MOC places a subscription for Landsat 7 metadata files. The subscription specifies products required, frequency of delivery, delivery mode, and user address. At the specified interval, ECS stages the requested metadata files for MOC transfer over Internet. The MOC has the option of requesting media distribution for the subscription. User registration, search and ordering procedures will be provided in update to the Science User's Guide and Operations Procedure Handbook for the ECS Project, 205-CD-001-002, pending the delivery of Release B.

4. Data Exchange Framework

Section 4 describes the data exchange framework supporting the ECS-Landsat 7 system interfaces presented in Section 3.1. The descriptions include network topologies, internetworking protocols, electronic data exchange, data exchange control messages, physical media data exchange, data exchange formats and data exchange security. Specific characteristics of each ECS-Landsat 7 data flow supported by the framework are provided in Section 5.

4.1 ECS-Landsat 7 Network Topologies

Network interfaces at the EDC DAAC supporting ECS-Landsat 7 data exchange include an EBnet-supported interface between LPS and ECS, an EDC Exchange LAN interface for IAS-ECS, an Internet supported interface for MMO-ECS data flows, and an Internet supported interface for ECS-MOC data flows, and an Internet supported interface for ECS-IGS data flows. Figure 3-1 provides a high level view of these network interfaces. The CSMS Design Specification for the ECS Project and the DAAC Design Specifications describe the topology of ECS local area networks, including the ECS connectivity to EBnet, connectivity with the NSI for Internet communications at the EDC DAAC, and connectivity with the EDC Exchange LAN.

4.1.1 LPS-to-ECS Network Topology

The LPS LAN uses a FDDI (Fiber Distributed Data Interface). The LPS network configuration supports LPS-ECS data exchange from five independent processors on the LPS LAN. Four processors are active, and one provides back-up. The LPS LAN-to-ECS LAN interface is achieved through interface equipment which provides a direct connection between the ECS LAN and LPS LAN. The interface between LPS and ECS at the EDC DAAC is provided by and managed by Ebnet. LPS and ECS each provide 2 multi-mode FDDI interface cables with media interface connectors (MIC) to connect to the EBnet-provided interface equipment. Backup interface equipment provides a switchover capability within 15 minutes. The interface equipment description is provided in the ICD between EBnet and LPS (Document # 540-097). Figure 4-1 illustrates this network topology, which is used exclusively to transfer Landsat 7 Format 1 and Format 2 Level 0R data, metadata, and browse for ECS ingest from each of the LPS processors.

4.1.2 Topology for Internet Communications

The topology for Internet communications requires a connection between interface entities (e.g. ECS and MMO; ECS and MOC) and an Internet provider. Internet connectivity does not require the same Internet provider be used by both sides of the interface. Landsat 7 MMO uses the NSI as their Internet provider. The ICD Between ECS and NSI specifies the details of the ECS-NSI

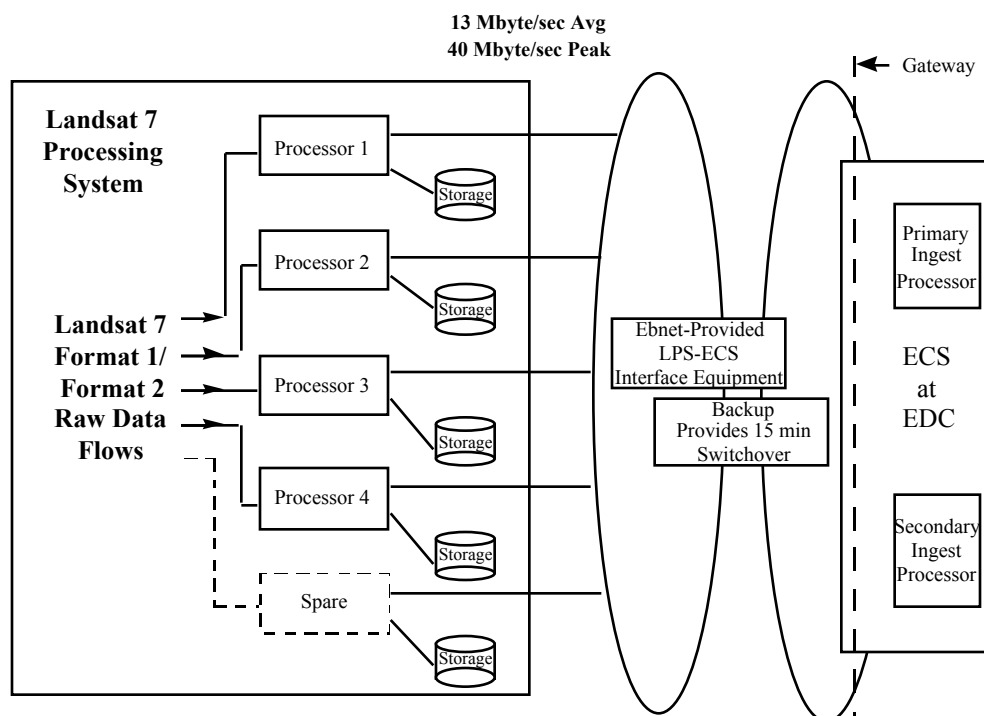


Figure 4-1. LPS-to-ECS Network Topology

interface. The topology of NSI is described in internal NSI documentation. Connectivities of IAS to the EDC Exchange LAN are described and controlled through IAS element interface documents/specifications.

4.2 Internetworking Protocols

The ECS-Landsat 7 physical communication links are supported by internetworking services that are consistent with the Open Systems Interconnection (OSI) reference model, as defined in the International Organization for Standardization, Basic Reference Model of Systems Interconnection (ISO 7498). These services are also described in "Internet Programming; Jamsa Press, Nevada, 1995". Connection-oriented services are provided using the TCP/IP protocol suite [Transmission Control Protocol/Internet Protocol].

4.2.1 Internet Protocol

The Internet Protocol (IP), specified in RFC 791, supports network layer data exchanges between the ECS and the Landsat 7 elements. The network layer provides the transparent transfer of data between transport entities. The IP addresses for the network nodes and data hosts are determined by the time of installation at EDC---Ebnet is responsible for registering and managing IP addresses.

4.2.2 Transport Protocol

Connection-oriented transport service is implemented using TCP. TCP, specified in RFC 793, is a connection-oriented, end-to-end reliable protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. It provides for guaranteed delivery of data between pairs of processors in host computers attached to networks within and outside ECS.

4.2.3 File Transfer Protocol

File transfers between ECS, LPS, MOC, IGS, and IAS host computers are accomplished through the use of standard File Transfer Protocol (ftp). File Transfer Protocol (ftp), as described in RFC 959, is an internet standard for file transfers that supports retrieval of files from a remote server.

ECS and interfacing Landsat elements supporting standard ftp data transfer must both host ftp software.

4.2.4 Simple Mail Transfer Protocol

All electronic mail (e-mail) message exchange is accomplished through the use of Internet e-mail messages. The protocol for Internet e-mail transfer is the Simple Mail Transfer Protocol (SMTP). SMTP is defined in RFC 821.

4.2.5 HyperText Markup Language/HyperText Transfer Protocol

HyperText Markup Language (HTML) is a simple markup language used to create hypertext documents that are portable from one platform to another. HTML protocols support generation of request forms used for interactive network ingest (an ECS service) of IAS provided data. The protocols for HTML are defined in HyperText Markup Language Specification Version 3.0. HTML, Version 3.0, is backwards compatible with HTML 2.0.

The HyperText Transfer Protocol (HTTP) is an application-level protocol used to access/transfer data created using the HTML. HTTP is used to access information in the EDC DAAC ECS Document Data Server. The basic version of HTTP is defined in the HyperText Transfer Protocol, Version 1.0, Internet-Draft. This document also defines status codes, which can include error information, that are returned as a result of transferring information via HTTP.

4.3 Distributed Computing Environment (DCE) and Security

A standardized processing environment, based on Open System Foundation's (OSF) Distributed Computing Environment (DCE) services, is used to maintain ECS security for intra-cell communications (within ECS) and inter-cell communications (between ECS and external data providers). DCE Security Services make use of configuration-controlled Access Control Lists (ACLs) authentication tools to maintain this security. When external data providers do not have DCE based configurations, as is the case for Landsat, gateway support is required. The gateway provides a point of control for verifying access and for translating the TCP/IP sockets to the corresponding RPCs (remote procedure calls) in the ECS DCE environment. It is important to note that e-mail is not a secured media (i.e., where data privacy and integrity would be

guaranteed). Therefore DCE security services do not support data transferred using e-mail services over the Internet. The protocol for Internet e-mail transfer is the Simple Mail Transfer Protocol (SMTP) discussed in section 4.2.4.

4.4 Data Exchange Between LPS and ECS

Level 0R data files, described in Section 5.1, are transferred from LPS to ECS using the ECS automated network ingest process, as defined in the Science Data Processing Segment (SDPS) Ingest Subsystem (INS) Design Specifications for the ECS Project. The transfer process is TCP/IP based and involves both the exchange of control messages and file transfer using standard ftp as the ECS ingest protocol for LPS-ECS data transfers (Section 4.2.3).

The ECS automated network ingest process is based upon the heritage of the Sensor Data Processing Facility (SDPF) software design, as described in the ICD Between the SDPF and the Tropical Rainfall Measuring Mission (TRMM) Consumers (560-203.103). For the LPS-ECS interface, both LPS and ECS are reusing some of the SDPF code.

4.4.1 LPS-to-ECS Automated Network Ingest

ECS automated network ingest uses TCP/IP-based electronic data exchange protocols for message exchanges and ECS-initiated ftp for file transfer. Since LPS is non-DCE, automated network ingest of LPS Level 0R data requires the support of a gateway. ECS is providing the gateway for LPS data transfer. The TCP/IP protocol supports message transmission through application program-to-application program TCP socket connections. Messages are sent through socket connections established between each LPS processor on the LPS LAN and the ECS gateway on the ECS LAN at EDC. The ECS gateway provides separate TCP connections with each LPS processor for message exchanges. Multiple socket connections can be initiated by each LPS processor for sending messages to ECS. The message exchanges are fully automated and may be fine-tuned through the operator tunable parameters, identified in the control message descriptions provided in Sections 4.4.5 through 4.4.10.

For file transfer, data files are pulled by ECS from an LPS processor staging area for delivery to the ECS Ingest Subsystem in response to an LPS Data Availability Notice (DAN). Each LPS processor stages the data files to be pulled (as identified in a corresponding DAN) in a separate staging area, as shown in Figure 4-1. All LPS-ECS file transfers using ftp are automated and constitute a data “pull”.

4.4.2 Data Exchange Control Messages

Automated data transfer from LPS to ECS requires transmission of certain control messages which provide the file information and handshaking required to complete the data transfer. Table 4-1 lists the different control messages supporting LPS-to-ECS automated network ingest. The format and contents of these messages are based upon the control messages described in the ICD Between SDPF and TRMM Consumers (560-203.103) to support SDPF software reuse. The SDPF message formats and contents have been modified for a tailored LPS-ECS interface, but remain compatible with the original SDPF software for interface commonality.

Transmission of the control messages listed in Table 4-1 follow a specific message transfer sequence. Figure 4-2 shows the generic transfer sequence that applies for a file transfer represented by one LPS DAN throughout the ECS automated network ingest process. The initiator of each TCP session becomes the controller of the session. The controller initiates the TCP connection, regulates message transmissions by handshake response, and terminates the session/TCP connection. The sequence supports transmission of multiple messages within each session as described in the following control message sequence description.

Table 4-1. Types of Data Exchange Control Messages

Message Name	Message Purpose	Description
Authentication Request	TCP Session Authentication	Request for authentication, required for each new TCP session
Authentication Response	TCP Session Authentication	Notification of authentication check results
Data Availability Notice (DAN)	Notification of Data Ready for Transfer	Notification from LPS to ECS that data is staged and ready for transfer. Includes the following information: locations from where the data can be pulled and list of granules (files) buffered for retrieval
Data Availability Acknowledgment (DAA)	Data Transfer Handshake	Acknowledgment sent by ECS to LPS that the DAN has been received; also provides notice of any DAN errors
Data Delivery Notice (DDN)	Acknowledgment of Data Transfer, Ingest and Archive	Notification to LPS from ECS that data has been transferred, ingested and archived; includes identification of data retrieval success and/or problems
Data Delivery Acknowledgment (DDA)	Data Transfer Handshake	Acknowledgment sent by LPS to ECS that the DDN has been received

4.4.3 LPS-ECS Control Message Sequence

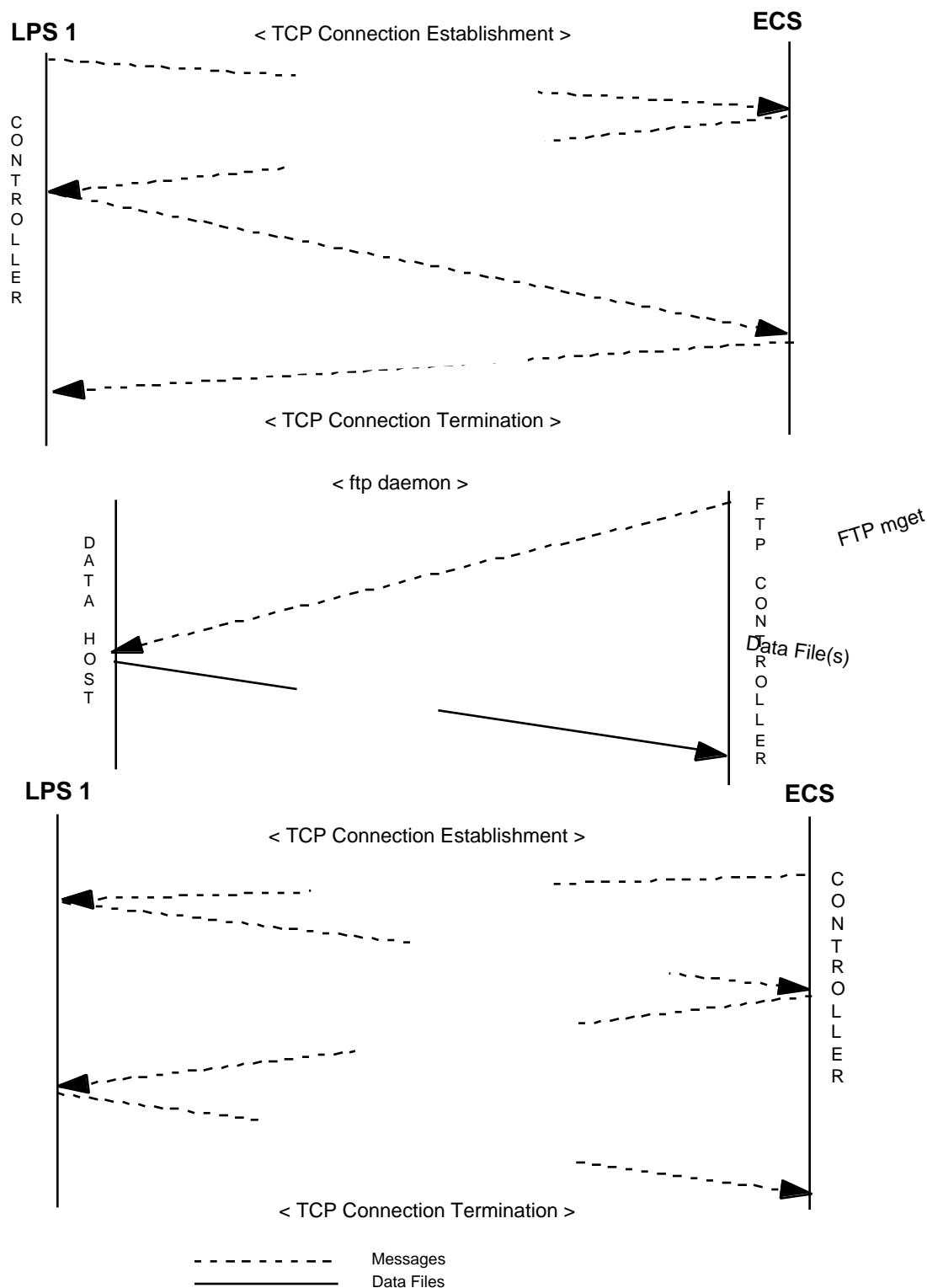
Per Figure 4-2, LPS makes data available to ECS by initiating an application program-to-application program TCP/IP connection with ECS. LPS, the session controller, sends an Authentication Request to ECS which performs an authentication check to verify privileges and returns an Authentication Response. Any rejection of the Authentication Request causes the TCP connection to be broken by ECS after ECS returns the Authentication Response. The controller may not transmit any queued messages until successful completion of the authentication process.

After LPS receives the Authentication Response indicating successful authentication, it sends a DAN message to ECS. A single DAN may include one or more file groups. An LPS file group is composed of multiple files relating to a single subinterval. Each file group contains either Landsat Level 0R Format 1 or Format 2 data and is handled as a "Landsat 7 Format" specific data set. For each file group, the DAN specifies the file names, file sizes, file types and file directories (i.e. path names); as well as the data type, descriptor and node name. ECS validates the DAN and then sends a DAA message indicating the disposition of the DAN.

Figure 4-3 shows a representation of a multiple LPS DAN scenario using a single TCP connection. An LPS processor may send multiple DANs over the same socket connection during a single TCP session. Each DAN still must be acknowledged first with a corresponding DAA handshake prior to transmission of any subsequent DANs over the same socket connection. Each LPS processor may also establish concurrent TCP connections with the ECS gateway, as necessary subject to limitations cited in Section 4.4.1, to transfer DANs. DAAs are sent by ECS via the same socket connection used to transmit its corresponding DAN. When LPS has transmitted all of its DANs and have received the corresponding DAAs from ECS, LPS terminates the TCP connection(s).

Typically, ECS accesses the LPS data for immediate transfer. Using standard ftp, ECS performs the “mget” file transfer, pulling all files at one time related to each error-free file group from the directory name(s) specified in the DAN. Through the file transfer process, the file's name and size are checked against DAN information. Transfer errors, DAN information discrepancies, and other file problems are captured and logged in the Data Delivery Notice (DDN). The DDN identifies transfer success and/or identified errors associated with all individual files for a particular DAN. Only complete file groups that are transferred without error are ingested and archived. It is important to point out that the Earth Science Data Types (ESDTs) for the Landsat LOR product must be in place before ingest or archive can occur.

Once archive is complete, ECS prepares to send the DDN by initiating a TCP connection with the appropriate LPS processor. The connection is initiated by the ECS Gateway. ECS establishes only one connection with a particular LPS processor to transfer queued DDN messages for that processor. ECS, which now becomes the session controller, sends an Authentication Request to LPS which performs an authentication check to verify privileges and returns an Authentication



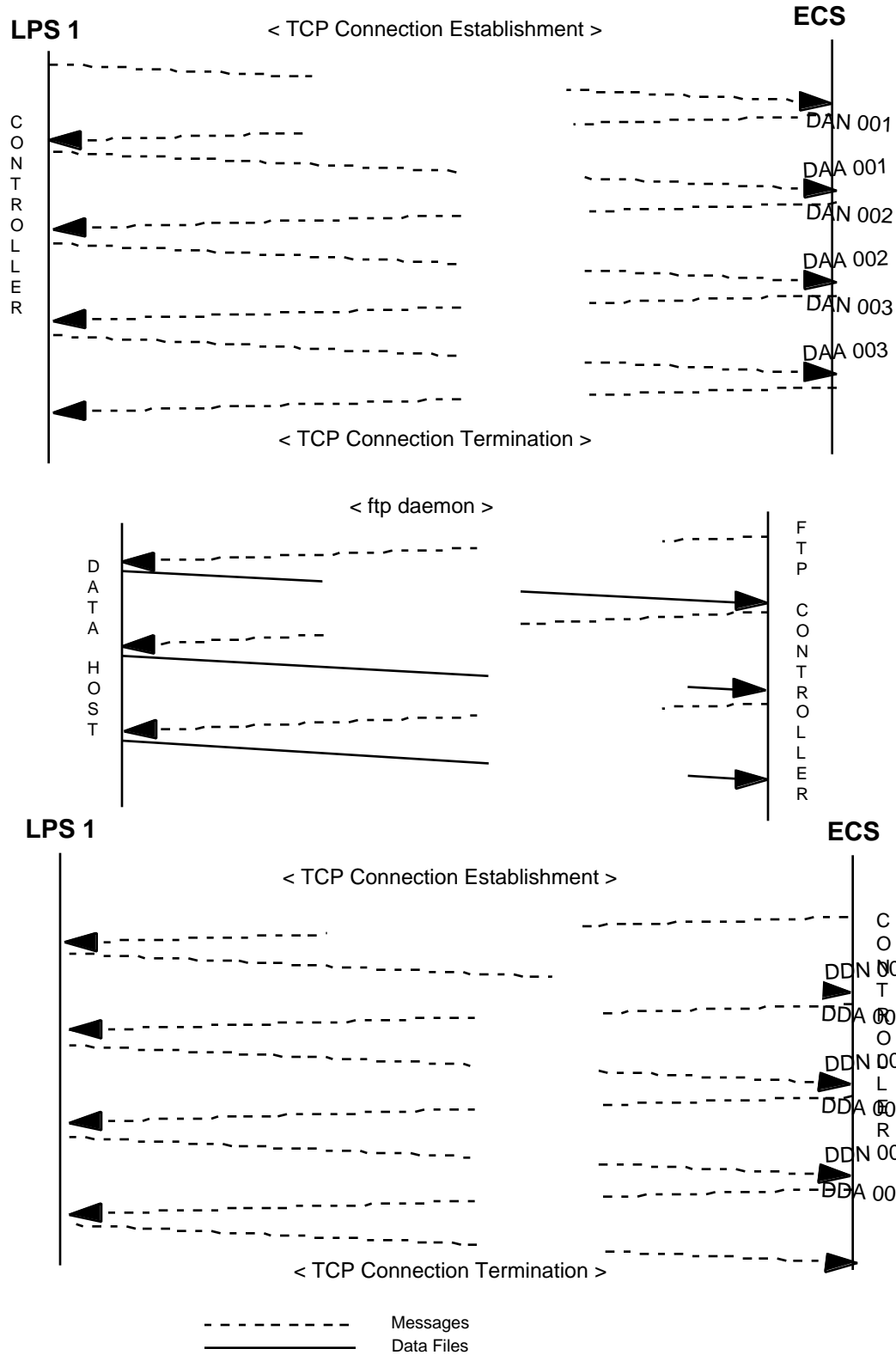


Figure 4-3. Multiple DAN Scenario

Response. ECS may not send the DDN message until successful completion of the authentication process. If the previous session(s) included multiple DANs, ECS sends a DDN response for each previously acknowledged DAN during this TCP session.

LPS is free to delete successfully transferred file groups upon receipt of the DDN. Files with errors as identified in the DDN must be corrected, and the complete file group must be resubmitted under a new DAN. LPS responds to each ECS DDN with a DDA message, acknowledging receipt of the DDN. ECS terminates the connection after receipt of the final DDA.

4.4.4 Control Message Format and Contents Overview

The control messages identified in Table 4-1 are described in Sections 4.4.5 through 4.4.10. The messages vary in purpose, length and format. Some messages are strictly handshaking messages, while others relate requisite information to support data transfer.

The message formats contain both fixed and variable length strings. A zero byte (NULL character) is used to terminate each variable length field in the manner of the C programming language, except for the DAN Parameter Value Language (PVL) Statements which use a semicolon as the delimiter for each field. Field lengths are specified in terms of bytes, where a byte is equal to an octet, i.e., 8 bits. The specified field lengths apply only to the parameter value and do not include the field delimiters. All fields designated as variable ASCII strings may vary in length up to the maximum field size.

The order of transmission of a group of bytes is the normal order in which they are read in English. Whenever a byte represents a numeric quantity, the left most bit in the message table is the high order or most significant bit. Similarly, whenever a multi-byte field represents a numeric quantity, the left most bit of the whole field is the most significant bit; the most significant byte is transmitted first.

When a control message contains errors or is sent in inappropriate sequence, it is rejected, and the message source receives notification from the message destination. Error conditions for each of the messages described in Sections 4.4.5 through 4.4.10 include out-of-bound parameter values, invalid parameter values, and missing parameter values (e.g., message type). In most cases, the message is corrected and resent with the exception of the Authentication Request. Rejection of an Authentication Request (as denoted by the Authentication Response) causes the TCP connection to be broken.

4.4.5 Authentication Request

Authentication is performed for the establishment of each TCP session. Table 4-2 provides the format and content of the Authentication Request. The Authentication Request is an application process-to-application process message sent using TCP. An Authentication Request is the first

Table 4-2. Authentication Request Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Authentication Request	Unsigned Integer (1 B)	15
Message Length	Length of Message in Bytes (non-zero integer)	Unsigned Integer (3 B)	Determined Message Length
Destination System ID	Communications Server	ASCII String (< 20 B)	Processor ID
Origination System ID	Communications Client	ASCII String (< 20 B)	Processor ID
User ID	User-provided identification; assigned by Destination system	ASCII (< 20 B)	User ID
Password	Authentication parameter - password assigned to User by Destination System	ASCII (< 20 B)	Password

message sent by the originator of the TCP session prior to transmission of any other data transfer message. It is used to validate the TCP session by verifying the originator's access. Both LPS and ECS use this message as needed to establish a connection between the ECS gateway and an LPS processor.

If the Authentication Request is rejected (as denoted by the Authentication Response), the TCP connection is broken. An Authentication Request fails if one or more of the following conditions are true:

- a. Message Type is not set to appropriate value.
- b. Message Length does not contain a value equal to the number of bytes of application data read in for the transmission.
- c. Destination System does not equal the correct string used to identify ECS or LPS
- d. Origination does not equal the correct string used to identify LPS or ECS.
- e. User ID and/or Password (for Origination System) are not the values expected for LPS or ECS.

4.4.6 Authentication Response

After the Destination System performs an authentication check on the Origination System, it returns an Authentication Response, which is the handshake message used to complete the authentication process. This message is also an application process-to-application process message sent using TCP. The Authentication Response is used to relate the results of the TCP session validation process. If the Origination System attempts to transmit another message prior to authentication completion, or the Authentication Request is rejected for one of the reasons listed in 4.2.3, then an Authentication Response message is returned with a disposition value '2'. Table 4-3 provides the format and content of the Authentication Response.

Table 4-3. Authentication Response Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Authentication Response	Unsigned Integer (1 B)	16
Message Length	Length of Message in Bytes (non-zero integer)	Unsigned Integer (3 B)	Determined Message Length
Destination System ID	Communications Server	ASCII String (< 20 B)	Copied from Corresponding Authentication Request
Origination System ID	Communications Client	ASCII String (< 20 B)	Copied from Corresponding Authentication Request
Authentication Disposition	Result of authentication	Integer (1B)	1 - accepted 2 - rejected

4.4.7 Data Availability Notice

The Data Availability Notice (DAN) is a control message that supports data transfer. A DAN message is sent by the system supplying the data (one of the LPS processors) to the system that ingests the data (ECS). An LPS DAN announces the availability of one or more Landsat 7 Level 0R file groups for transfer. The DAN serves as the stimulus for automated network transfer and ingest of those data. When multiple DANs are sent within a single TCP session, LPS must be able to support concurrent ftp for all file groups associated with the DANs. The DAN(s) should not be sent until the LPS processor is ready to support the next pull.

LPS operator tunable parameters for the LPS DAN include number of transmission attempts and the time between attempts. When the set number of attempts has been performed without success, operator intervention is required.

The DAN identifies the total file count the data type, individual file names, types, sizes and directory names. The maximum message length allowed for a DAN is 1 Mbyte (1,048,576 bytes). Each DAN includes a Message Header, Exchange Data Unit (EDU) Label, a DAN Label, and Parameter Value Language (PVL) Statements. Format and contents for the DAN Message Header and Labels are defined in Table 4-4. ECS does not use the information in the EDU and DAN Labels for LPS data ingest. These labels are maintained in the structure for consistency with the SDPF software design and the ECS-SDPF interface.

DAN PVL Parameters are defined in Table 4-5. DAN PVL Statements are ASCII strings, having at most 512 characters, in the form of: "PARAMETER = Value;". The Value strings may be predefined values, ASCII numeric strings, ISO time strings, or arbitrary strings. If the Value field contains spaces or a semicolon, it must be enclosed in double quotes. There may be white space before, after, or between items of each element, where items are parameter names, parameter values, or "=", with the following exceptions: (i) comments must be placed at the beginning of each line or following the ";", and (ii) no white space may be placed immediately preceding the ";". If white space characters are contained within quotation marks in an ASCII string of the value field, (e.g., blanks in a file name) they will not be removed. This white space may be

Table 4-4. DAN Message Header and Labels
Message Header (4 Bytes)

Field	Description	Type (Length in Bytes)	Value
Message Type	DAN Indicator	Unsigned Integer (1B)	1 - Indicates DAN
Message Length	Length of Message in bytes	Unsigned Integer (3B)	Length of Message

Exchange Data Unit (EDU) Label (20 Bytes)

Field	Description	Type (Length in Bytes)	Value
Control Authority ID	Not used	ASCII (4 B)	Not used*
Version ID	Not used	ASCII (1 B)	Not used*
Class ID	Not used	ASCII (1 B)	Not used*
S1	Not used	ASCII (1 B)	Not used*
S2	Not used	ASCII (1 B)	Not used*
Data Description	Not used	ASCII (4 B)	Not used*
Delimitation Parameter	Not used	ASCII (8 B)	Not used*

DAN Label (20 Bytes)

Field	Description	Type (Length in Bytes)	Value
Control Authority ID	Not used	ASCII (4 B)	Not used*
Version ID	Not used	ASCII (1 B)	Not used*
Class ID	Not used	ASCII (1 B)	Not used*
S1	Not used	ASCII (1 B)	Not used*
S2	Not used	ASCII (1 B)	Not used*
Data Description	Not used	ASCII (4 B)	Not used*
Delimitation Parameter	Not used	ASCII (8 B)	Not used*

* Note: ECS does not care what is in this field.

blank(s), a carriage return, or linefeed, tab, or comment Comments are enclosed in delimiters as follows: /*...comment...*/. The semicolon at the end of each statement serves as the field delimiter. PVL statements may occupy multiple lines. The PVL code details can be found in the document PVL SPEC - Parameter Value Language Specification (CCSDS 641.0-B-1). A PVL tutorial is also available in CCSDS 641.0-G-1.

The values shown in Tables 4-4 and 4-5 include pre-defined values enclosed within single quote marks and processor determined values. The maximum size identified for a DAN parameter applies only to the value within a PVL statement. If any parameter value includes white space characters, it must be enclosed in double quote marks within the ASCII string. Processor determined values include ASCII alphanumerics, ASCII numerics, and ISO times to be filled in with appropriate values by an LPS processor during DAN creation. The DAN Sequence Number is the critical parameter that provides the link between related DAN, DAA, DDN, and DDA control messages. For the LPS-ECS interface, each DAN Sequence Number and Originating System (LPS Processor) identification combination must be unique.

Table 4-5. DAN PVL Parameters (1 of 2)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of DAN	Variable String	ASCII 20B	LPS Processor Identifier (Note 1)
DAN_SEQ_NO	Sequence no. assigned by Originating System	Unsigned 32-bit Integer	ASCII 10B	$< 4.295 \times 10^9$
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII 4B	1 - 9999
EXPIRATION_TIME	ISO date and time that data can be deleted from originating system. This time is set by the LPS based on available resources. (Note 3)	Fixed String	ASCII 20B	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T and Z are literals
OBJECT	Start of file group parameters (repeat for each group of files). (Note 2)	Fixed String	ASCII 10B	'FILE_GROUP'
DATA_TYPE	ECS Data Type (Note 4)	Variable String	ASCII 20B	'L70RF1', 'L70RF2'
DESCRIPTOR	Name of instrument or sensor that collected the data (Notes 4)	Variable String	ASCII 60B	'ETM+' or input LPS Subinterval ID
NODE_NAME	Name of network node on which the file group resides	Variable String	ASCII 64B	e.g. l7xslrv.gsfc.nasa.gov
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII 9B	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 5)	e.g. /LPS1/SUB1/FM1/

Note 1. Each processor must have a unique identifier.

Note 2. LPS file group contains all files related to a single subinterval format-specific data set.

Note 3. ECS detects and reports to the DAAC operations staff DANs that exceed the EXPIRATION_TIME's date and time. The detected DANs are not stopped.

Note 4. LPS requires that each combination of DATA_TYPE and DESCRIPTOR be unique within a FILE_GROUP---ECS does not validate this.

Note 5 Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID. See example DAN, Figure 4-4.

Table 4-5. DAN PVL Parameters (2 of 2)

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
FILE_ID	File name	Variable String	ASCII (Note 7)	LPS file name (per naming convention in Section 5.1.3)
FILE_TYPE	File Data Type	Variable String	ASCII 20B	'IMAGE1', 'IMAGE2', 'IMAGE3', 'IMAGE4', 'IMAGE5', 'IMAGE6', 'IMAGE7', 'IMAGE8' 'CALIBRATION', 'METADATA', 'BROWSE' 'MSCD', or 'PCD'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII 10B	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII 9B	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII 10B	'FILE_GROUP'

Note 7. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID. See example DAN, Figure 4-4.

DANs are validated to check that all required fields contain valid values and that the format of the message is correct and consistent with the standards. DANs that adhere to the defined message standards shown in Tables 4-4 and 4-5 are accepted and processed. An example LPS DAN PVL is provided in Figure 4-4. Values that are followed by empty comment holders (/* */) have been arbitrarily created for the sake of example.

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

If the DAN is reported to have any errors as reported by ECS in the DAA, the DAN is not processed. ECS does not process any of the file groups in the DAN. For DAN file groups with errors, LPS must correct the files/file information accordingly and retransmit the corrected file group(s) under a new DAN. ECS sends a separate DAA to LPS indicating the disposition of each DAN.

```

ORIGINATING_SYSTEM = LPS_3;
DAN_SEQ_NO = 5326; /* */
TOTAL_FILE_COUNT = 42;
EXPIRATION_TIME = 1998-11-09T20:00:00Z;
OBJECT = FILE_GROUP;
    DATA_TYPE = L70RF1;
    DESCRIPTOR = SubXYZQ; /* */
    NODE_NAME = L7XLSRV.GSFC.NASA.GOV; /* */
    OBJECT = FILE_SPEC;
        DIRECTORY_ID = /*LPS3 Directory Branch to File*/;
        FILE_ID = L71EDC139831218020.B10;
        FILE_TYPE = IMAGE1;
        FILE_SIZE = 242120;
    END_OBJECT = FILE_SPEC;
    OBJECT = FILE_SPEC;
        DIRECTORY_ID = /*LPS3 Directory Branch to File*/;
        FILE_ID = L71EDC139831218020.B20;
        FILE_TYPE = IMAGE2;
        FILE_SIZE = 242120;
    END_OBJECT = FILE_SPEC;
    OBJECT = FILE_SPEC;
        DIRECTORY_ID = /*LPS3 Directory Branch to File*/;
        FILE_ID = L71EDC139831218020.MTA;
        FILE_TYPE = METADATA;
        FILE_SIZE = 67561;
    END_OBJECT = FILE_SPEC;
/*~~~~~*/
/* Repeat FILE_SPEC objects for each LPS Level 0R data file within file group*/
/*~~~~~*/
    OBJECT = FILE_SPEC;
        DIRECTORY_ID = /*LPS3 Directory Branch to File*/;
        FILE_ID = L71EDC139831218020.R12;
        FILE_TYPE = BROWSE;
        FILE_SIZE = 1667561;
    END_OBJECT = FILE_SPEC;
END_OBJECT = FILE_GROUP;

```

Figure 4-4. Example DAN PVL for LPS Level 0R Data Files

4.4.8 Data Availability Acknowledgment

A Data Availability Acknowledgment (DAA) message is the corresponding handshake/control message for the DAN. ECS sends a DAA in response to each LPS DAN received. The DAA acknowledges receipt of the DAN and provides the mechanism to identify the status of data transfer scheduling and any DAN errors. One or more negative disposition bits in a short DAA means the entire DAN has been rejected. Its information must be corrected and resubmitted under a new DAN. Since the LPS does not expect the ECS to "get" any file groups in a failed DAN, a DDN sent for a failed DAN will be treated as an error.

The short form of the DAA shown in Table 4-6 is used primarily to respond to error-free DANs, DANs with message header errors and errors in DAN PVL that are not attributable to specific file groups. An example short DAA message definition is depicted in Table 4-7. The long form of the DAA message shown in Table 4-8 is used when one or more file groups in the DAN have associated errors. An example long DAA message definition is depicted in Table 4-9.

4.4.9 Data Delivery Notice

A Data Delivery Notice (DDN) is an electronic message sent announcing the status of data transfer and archival. Each DDN corresponds to a single DAN. A DDN is sent by ECS after the retrieval and archival of transferred file groups listed in the LPS DAN. The DDN announces the completion of file transfer preprocessing, and archival, and identifies the success or reason of failure for each file.

The short DDN is used for error-free data transfers and errors relating to all file groups, e.g., communication related errors. If all files related to a DAN do not have the same disposition, the long form of this message is used. In accordance with the SDPF design, the long DDN identifies the disposition of every file in a particular DAN. This includes files transferred successfully, files for which there were transfer problems, and files for which there are ingest problems (e.g., metadata checking related errors). In order to provide better delineation of error conditions, the dispositions identified in the SDPF DDN message (SDPF ICD, 560-203.103) have been augmented in support of LPS-ECS data transfer. For interface consistency, SDPF defined dispositions are not changed.

Format and contents for the short and long DDNs are shown in Tables 4-10 and 4-12 respectively. Examples of the short and long DDN message definitions are depicted, respectively, in Tables 4-11 and 4-13. Note that the Data Retrieval Response (DRR) Sequence Number is not used; DRRs apply to a 'Put' interface, which is not used for LPS-ECS file transfers. ECS sends a DDN in response to each received DAN. Each DDN is sent to the LPS processor from which ECS received the corresponding DAN. ECS receives a DDA response from each LPS processor acknowledging receipt of each DDN prior to TCP session termination.

Table 4-6. Short DAA Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Short Data Availability Acknowledgment	2
Message Length	Unsigned Integer (3B)	Length of Message in Bytes	13
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Disposition	Logical Bits (4B)	Disposition Bits - - meaning: accepted not used invalid DAN Sequence Number not used not used not used invalid file count not used ECS internal error not used not used invalid DAN length not used database failures duplicate DAN sequence number not used spares invalid PVL statement missing or invalid originating system data provider request threshold exceeded data provider volume threshold exceeded system request threshold exceeded system volume threshold exceeded	Bit location set to 1: none 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15-25 26 27 28 - 29 - 30 31
Transfer Start Time	Integer (1B)	Not Used	not used

Table 4-7. Example Short DAA Message Definition

Message Type	2
Message Length	13
DAN Sequence No.	1
Disposition	00000000000000000000000000000000 * (accepted)
Transfer Start Time	

* Logical bits

Table 4-8. Long DAA Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Long Data Availability Acknowledgment	3
Message Length	Unsigned Integer (3B)	Length of Message In Bytes	Input length of message in bytes
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Number of File Groups (to follow)	Integer (4B)	Number of File Groups with Errors	Input file group count

For each file group having errors in the Data Availability Notice

Data Type PVL	ASCII String (<20B)	ECS Data Type	Supplied in DAN
Descriptor PVL	ASCII String (<60B)	Name of instrument/sensor that collected the data	Supplied in DAN
Disposition	Logical Bits (2B)	Disposition bits - meaning: not used invalid data type* not used descriptor missing invalid directory* not used not used not used invalid file size field not used not used invalid file ID* not used spare invalid node name* invalid file type*	Bit location set to 1: --- 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

* Null string check only.

If the DAN is reported to have errors as reported by ECS in the DDN, ECS processes only those file groups without errors. For DAN file groups with errors, LPS must correct the files/file information accordingly and retransmit the corrected file groups under a new DAN. File groups that were successfully transferred/archived should not be included in the revised DAN.

ECS operator tunable parameters for the ECS DDN include number of transmission attempts and the time between attempts. When the set number of attempts has been performed without success, operator intervention is required.

Table 4-9. Example Long DAA Message Definition

Message Type	3
Message Length	36
DAN Sequence No.	1
Number of File Groups (to follow)	2
Data Type PVL	L70RF1
Descriptor PVL	SubXYZQ
Disposition	01000000000000000000000000000000* (invalid DAN sequence number)
Data Type PVL	L70RF2
Descriptor PVL	SubXYZQ
Disposition	00000000000000000000000000000000* (accepted)

* Logical bits

Table 4-10. Short DDN Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Short Data Delivery Notice	11
Message Length	Unsigned Integer (3B)	Length of Message in Bytes	40
DRR Sequence No.	Integer (4 B)	Not used	0
DAN Sequence No.	Unsigned Integer (4B)	Sequence number assigned by Originating System	Supplied in DAN
Disposition	Integer (1B)	One of the following: Successful Network Failure Unable to Establish FTP Connection Not used All File Groups/Files not Found FTP failure Post-transfer file size check failure FTP Command Failure Spares Duplicate file name in granule Metadata Preprocessing error Resource Allocation Failure Ingest S/W Internal Error Data base Access Error Incorrect Number of Metadata Files Incorrect Number of Science Files Incorrect Number of Files Data Conversion Failure Request Cancelled Unknown Data Type Invalid or Missing File Type File I/O Error Data Archive Error	- 0 1 2 3 4 5 6 7 8 - 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255
Spares	(3 B)		
Time Stamp	ASCII (20 B)	ISO Time when Destination System transferred the last part of the data (all files)	GMT in the format: yyyy- mm-ddThh:mm:ssZ, where T and Z are literals
Throughput	Integer (4 B)	Rate in bytes per second averaged over all files	> 0 (‘0’ indicates unsuccessful transfer)

Table 4-11. Example Short DDN Message Definition

Message Type	11
Message Length	40
DRR Sequence No.	0
DAN Sequence No.	1
Disposition	0 (Successful)
Spares	
Time Stamp	1999-09-27T11:49:38Z
Throughput	10000

Table 4-12. Long DDN Message Definition

Field	Type (Length in Bytes)	Description	Value
Message Type	Unsigned Integer (1B)	Long Data Delivery Notice	12
Message Length	Unsigned Integer (3B)	Length of Message	Input length of message in bytes
DRR Sequence No.	Integer (4 B)	Not used	0
DAN Sequence No.	Unsigned Integer (4B)	Sequence no. assigned by Originating System	Supplied in DAN
Number of Files	Integer (4 B)	Total File Count in DAN	Supplied in DAN

For each File in the Data Availability Notice

File Directory	ASCII (equivalent to DAN Length)	Variable ASCII string specifying file directory location	Supplied in DAN
File Name	ASCII (equivalent to DAN Length)	File name in ASCII string	Supplied in DAN
File Transfer Disposition	Integer (1B)	One of the following: Successful Network Failure Unable to Establish FTP Connection Not used All File Groups/Files not Found FTP failure Post-transfer file size check failure FTP Command Failure Spares Duplicate file name in granule Metadata Preprocessing error Resource Allocation Failure Ingest S/W Internal Error Data base Access Error Incorrect Number of Metadata Files Incorrect Number of Science Files Incorrect Number of Files Data Conversion Failure Request Cancelled Unknown Data Type Invalid or Missing File Type File I/O Error Data Archive Error	0 1 2 3 4 5 6 7 8 - 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255
Time Stamp	ASCII (20B)	ISO Time when Destination System transferred the last part of the data	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T and Z are literals
Throughput	Integer (4B)	Rate in bytes per second for each file identified	> 0 (‘0’ indicates unsuccessful transfer)

Table 4-13. Example Long DDN Message Definition

Message Type	12
Message Length	20041
DRR Sequence No.	0
DAN Sequence No.	1
Number of Files	2
File Directory	LPS3
File Name	L71EDC139831218020.B10
File Transfer Disposition	1 (Network Failure)
Time Stamp	1999-09-27T11:49:38Z
Throughput	0 (unsuccessful transfer)
File Directory	LPS3
File Name	L71EDC139831218020.MTA
File Transfer Disposition	5 (FTP Failure)
Time Stamp	1999-09-27T11:49:38Z
Throughput	0 (unsuccessful transfer)

4.4.10 Data Delivery Acknowledgment

A Data Delivery Acknowledgment (DDA) is the corresponding handshake/control message for the DDN. The DDA provides the mechanism for LPS to acknowledge receipt of the DDN. The DDA is shown in Table 4-14. The DDA disposition is always set to “0” by LPS.

Table 4-14. DDA Message Definition

Field	Description	Type (Length in Bytes)	Value
Message Type	Data Delivery Acknowledgment	Unsigned Integer (1B)	17
Message Length	Length of Message in Bytes	Unsigned Integer (3B)	33
DRR Sequence No.	Not used	Integer (4 B)	0
DAN Sequence No.	Sequence number assigned by Originating System	Unsigned Integer (4B)	Supplied in DAN
Disposition	DDN Received Spare	Integer (1 B)	0 1- 255
Time Stamp	ISO Time when Destination System transferred the last part of the data	ASCII (20 B)	Null (Note 1)

Note 1: A single “0” is sufficient to null the string out.

4.4.11 LPS-ECS Electronic Data Exchange Back-up Methods

Identification of error handling conditions related to each ECS-Landsat 7 data flow are provided in Section 5. Network/communication related errors may require either LPS or ECS operator intervention (depending on the message originator) for diagnosis and correction. If LPS-ECS communication/data transfer has been suspended due to network problems, and LPS no longer has processor disk space available for staging processed files, Level 0R data processing is suspended until communication is restored. LPS handling of this failure scenario is identified in the Landsat 7 Processing System (LPS) System Design Specification (Doc. # 560-8SDS/0194). Suspension of LPS processing requires backing-up raw Landsat 7 data using the LPS 30-day archive capability. The policy and methodology for using the LPS 30-day archive under these conditions and for processing the data after communication restoration are under the control of the Landsat 7 Project. Per the Inter-Project Agreement between ESDIS and the Landsat 7 Project, ECS provides no back-up storage of Landsat 7 raw data.

Use of tape media back-up for LPS-ECS data transfer, although supported by ECS, is not an option supported by LPS. Ingest of data which has been stored on hard media can be supported by ECS for other Landsat 7 element interfaces.

4.4.12 LPS-ECS Electronic Data Exchange Security

LPS-ECS message transfer security is supported by the authentication of each new TCP session, using the Authentication Request and Response, described in 4.4.5 and 4.4.6 respectively. The ECS gateway performs the authentication check on requests received from LPS. LPS is responsible for performing the authentication check on requests received from ECS.

Authentication includes verification of the originating system ID. Address changes must be coordinated. Passwords are unencrypted. User IDs and passwords are needed for ftp connections and are maintained by ECS. It is recommended that User IDs and passwords be changed, via the DAAC administrator, periodically (on the order of every six months) or whenever a system compromise is suspected. No additional security measures are applied for data transfer.

4.5 Data Exchange Between IAS and ECS

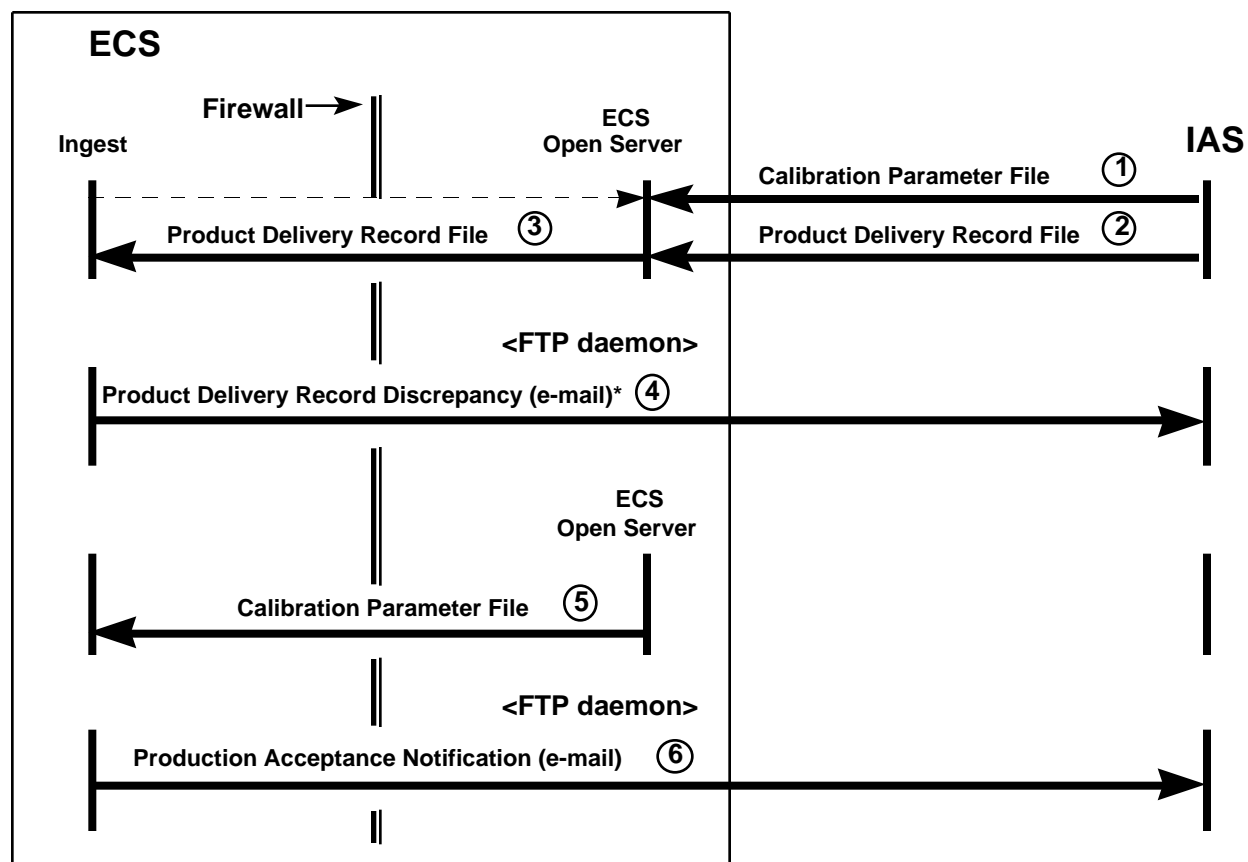
Data exchange between the Landsat 7 IAS and ECS consists of calibration parameter files (CPF) and reports being sent from IAS to ECS. The IAS calibration parameter files are described in document 430-15-01-002-0, Landsat 7 Calibration Parameter File Definition. Data transfer is accomplished through the use of ECS Polling Ingest with Product Delivery Record (PDR) process, as defined in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project.

4.5.1 Polling Ingest With PDR

The purpose of the ECS/IAS electronic interface is to support the delivery of the Calibration Parameters File (CPF) and associated reports from the IAS to ECS. A Polling Ingest with Product Delivery Record (PDR) mechanism is employed for the purpose of transferring the CPF--the mechanism for transferring reports to the ECS Document Data Server is TBR. To accommodate this interface, a single server, under ECS administrative control, will be identified on the open side of the ECS firewall; the CPF and the IAS PDRs will be placed on this open server by the IAS. This implementation of the Polling Ingest with PDR consists of the following steps (see Figure 4-5):

- a. IAS places CPF on open server in specified location -
- b. IAS generates IAS PDR; places IAS PDR on open server in known directory -
- c. With operator tunable periodicity, ECS polls directory on "open" server, and detects/retrieves IAS PDR -

The ECS side of the interface is equipped with an FTP daemon---a computer program which automatically, and with operator-tunable periodicity, polls the "open" server, detects an IAS PDR file via an FTP "-ls" command, and acquires the IAS PDR file information via an FTP "get" command. At the "open" server, an FTP daemon



* Only generated if errors are found in IAS PDR

Figure 4-5. IAS/ECS Calibration Parameter File Transfer Mechanism

continually listens for incoming FTP requests, acts on each arriving FTP request, and routes each FTP request to the appropriate account, making the directory sub-tree available to ECS with the allowable privileges.

- d. ECS sends Product Delivery Record Discrepancy (PDRD) to IAS (via e-mail) indicating error/success dispositions for file groups in PDR -

Once an IAS PDR has been detected/acquired by ECS, the IAS PDR is validated. In the event that the IAS PDR is invalid, ECS automatically returns a Product Delivery Record Discrepancy (PDRD), via e-mail, to the supplier system (i.e., IAS), indicating the error/success dispositions for filegroups in the IAS PDR resulting from ECS's attempt to

validate the IAS PDR. If the IAS PDR is valid, ECS schedules to pull the CPF using an FTP "get" command; in this case no PDRD is sent. If an error is found in the IAS PDR, processing is terminated and none of its files is transferred to the closed server for processing until a corrected IAS PDR is received and successfully processed.

- e. ECS pulls the CPF from the open server to be ingested. The CPF is then archived.
- f. ECS sends a Production Acceptance Notification (PAN) to the IAS (via e-mail) indicating either success or errors found.

Operator tunable parameters for the transfer of the PDR, PDRD and PAN include the time the supplier system (i.e., IAS) waits to receive a PDRD (or PAN) before placing another IAS PDR in the directory on the "open" server. All relevant operator tunable parameters will be identified in the DAAC operations Manual (DID 611)

The Polling Ingest with PDR transfer mechanism is fully automated. In the context of this transfer mechanism, this section addresses the IAS PDR, PDRD and PAN. In addition, the error conditions, error handling/backup methods, and physical media are discussed herein.

4.5.2 IAS Product Delivery Record

The purpose of the IAS PDR is to announce the availability of a Calibration Parameters File (CPF) for transfer, including file names, file size, location, etc. The IAS PDR is generated and placed in an operator configurable (pre-specified) directory on an operator configurable "open" server (located on the open side of the ECS firewall, but under ECS administrative control) by the system supplying the data (i.e., the IAS) after the data files referenced in the IAS PDR have been placed into their respective directories. ECS polls the "open" server, detects/acquires/validates the IAS PDR, and schedules to pull the CPF.

The IAS PDR format is comprised of Parameter-Value Language (PVL) Statements. The required IAS PDR PVL parameters are depicted in Table 4-15. The IAS PDR PVL statements are ASCII strings, having at most 256 characters, in the form: "Parameter = Value." The Value strings shown in Table 4-15 include pre-defined values shown by single quote marks and processor determined values which include ASCII strings, ISO times, and integers to be filled in with appropriate values by an IAS System processor during IAS PDR creation. An example IAS PDR PVL for a CPF is provided in Figure 4-6. The maximum allowed message length for a IAS PDR is 1 megabyte. IAS PDRs are validated to check that all required fields contain valid values and that the format of the IAS PDR is correct and consistent with the standards. IAS PDRs that adhere to the defined message standards shown in Table 4-15 are accepted and processed. Using the file naming convention depicted in Table 4-16, unique file names (time-based) are assigned to each IAS PDR, so as to avoid potential overwrites (an example IAS PDR File Naming Convention is depicted in Figure 4-8).

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

Additional information on PVL can be found in the document entitled, “Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book.”

Table 4-15. IAS PDR PVL Parameters

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of Delivery Record	Variable String	ASCII (20)	IAS Processor Identifier (Note 1)
TOTAL_FILE_COUNT	Total number of files to transfer	Integer	ASCII (4)	1 - 9999
OBJECT	Start of file group parameters (repeat for each group of files).	Fixed String	ASCII (10)	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII (8)	'IAS_DATA'
NODE_NAME	Name of network node on which the file resides	Variable String	ASCII (64)	e.g., 'calibsrv.nasa.gov'
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII (9)	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 2)	e.g. CAL/IAS
FILE_ID	File name	Variable String	ASCII (Note 3)	IAS file name (per Landsat 7 Calibration Parameter File Definition)
FILE_TYPE	File Data Type	Variable String	ASCII (20)	'CAL_COEF'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII (10)	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII (9)	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII (10)	'FILE_GROUP'

Note 1. Used in PAN & PDRD to identify IAS response.

Note 2. Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID.

Note 3. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID.

EXAMPLE ONLY	EXAMPLE ONLY
<pre> ORIGINATING_SYSTEM = IAS1234; /* IAS Processor Identifier */ TOTAL_FILE_COUNT = 1; OBJECT = FILE_GROUP; DATA_TYPE = IAS_DATA; /* Allowed values pre-defined by ECS */ NODE_NAME = calibsrv.nasa.gov OBJECT = FILE_SPEC; DIRECTORY_ID = CAL/IAS FILE_ID = L71998001IASCAL.A01; /* '01' = File #, 'A' = Version */ FILE_TYPE = CAL_COEF; /* Allowed values pre-defined by ECS */ FILE_SIZE = 1000000; END_OBJECT = FILE_SPEC; ----- /* Repeat FILE_SPEC objects for each IAS data file within file group */ ----- END_OBJECT = FILE_GROUP; ----- /* Repeat FILE_GROUP objects for each different file group */ ----- </pre>	

Figure 4-6. Example IAS PDR PVL For Calibration Parameter File

Table 4-16. File Naming Convention For IAS Product Delivery Record

Field	Description	Format/ Type Max Size (Bytes)	Value
IAS Designation	Designation for IAS	ASCII String (20)	Originating System in IAS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PDR filename	ASCII String (3)	'PDR'

EXAMPLE ONLY	EXAMPLE ONLY
<p>FILENAME = IAS123.yyyymmddhhmmss.PDR,</p> <p>where</p> <p>yyymmddhhmmss = date of PDR file creation = 20010719123845,</p>	
EXAMPLE ONLY	EXAMPLE ONLY

Figure 4-7. Example IAS PDR File Naming Convention

4.5.3 Product Delivery Record Discrepancy

The Product Delivery Record Discrepancy (PDRD) is sent by ECS to the supplier system (i.e., IAS), via automatic e-mail, only in the event that the PDR cannot be successfully validated. The PDRD indicates the error/success dispositions for file groups in the IAS PDR resulting from ECS's attempt to validate the IAS PDR. Using the file naming convention depicted in Table 4-17 (an example is provide in Figure 4-8), unique file names (time-based) are assigned to each PDRD. There are two forms of PDRD, including a short form (Table 4-18) and long form (Table 4-19). The short form is used for IAS PDRs with errors in the IAS PDR PVL that are not attributable to specific file groups. The long form is used when one or more file groups in the IAS PDR have invalid parameters; some may be error-free. For each file group, if an error is encountered, ECS ceases processing and reports the error which it just encountered in that file group. None of the remaining conditions in that file group is validated. ECS processing then continues on with the next file group in the IAS PDR. None of the files is transferred to the ECS for processing until a corrected PDR is received and successfully processed. The PDRD consists of PVL Statements. Short and long PDRD PVL examples are provided, respectively, in Figure 4-9 and Figure 4-10. In the event that a PDRD indicates that one or more errors have been encountered during validation of the IAS PDR, the IAS must correct the errors and resubmit the entire IAS PDR for processing.

Table 4-17. File Naming Convention For Product Delivery Record Discrepancy

Field	Description	Format/ Type Max Size (Bytes)	Value
IAS Designation	Designation for IAS	ASCII String (20)	Originating System in IAS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyymmddhhmmss
Filename extension	Extension for file PDRD filename	ASCII String (4)	'PDRD'

EXAMPLE ONLY	EXAMPLE ONLY
<p>FILENAME = IAS.yyyymmddhhmmss.PDRD,</p> <p>where</p> <p>yyymmddhhmmss = date of PDR file creation = 20010719123845,</p>	
EXAMPLE ONLY	EXAMPLE ONLY

Figure 4-8. Example PDRD File Naming Convention

Table 4-18. Short Product Delivery Record Discrepancy PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Short Product Delivery Record Discrepancy	Fixed String/ASCII (9)	SHORTPDRD
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	"INVALID FILE COUNT" "ECS INTERNAL ERROR" "DATABASE FAILURES" "INVALID PVL STATEMENT" "MISSING OR INVALID ORIGINATING_SYSTEM PARAMETER" "DATA PROVIDER REQUEST THRESHOLD EXCEEDED" "DATA PROVIDER VOLUME THRESHOLD EXCEEDED" "SYSTEM REQUEST THRESHOLD EXCEEDED" "SYSTEM VOLUME THRESHOLD EXCEEDED"

Note 1. In any given instance, only one disposition value is provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value is followed by an EOL mark.

Table 4-19. Long Product Delivery Record Discrepancy PVL Parameters

Parameter2	Description	Type/Format (Length in Bytes)	Value2
MESSAGE_TYPE	Long Product Delivery Record Discrepancy	Fixed String/ASCII (8)	LONGPDRD
NO_FILE_GRP5 to follow)	Number of File Groups with Errors	Integer/ASCII (4)	Number of File groups, in IAS PDR, with errors

For each file group in the PDR

DATA_TYPE	ECS Data Type	ASCII String (20)	DATA_TYPE in IAS PDR
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	"SUCCESSFUL" "INVALID DATA TYPE" * "INVALID DIRECTORY" * "INVALID FILE SIZE" "INVALID FILE ID" * "INVALID NODE NAME" * "INVALID FILE TYPE" *

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

* Null string check only

EXAMPLE ONLY**EXAMPLE ONLY**

MESSAGE TYPE = SHORTPDRD;
DISPOSITION = DATABASE FAILURES;

Figure 4-9. Example Short PDRD PVL**EXAMPLE ONLY****EXAMPLE ONLY**

MESSAGE_TYPE = LONGPDRD;
NO_FILE_GRP5 = 2;
DATA_TYPE = IAS_DATA;
DISPOSITION = "INVALID DATA TYPE";
DATA_TYPE = IAS_DATA;
DISPOSITION = "INVALID FILE ID";

Figure 4-10. Example Long PDRD PVL

4.5.4 Production Acceptance Notification

After the data have been ingested/archived by ECS, ECS automatically sends a "Production Acceptance Notification (PAN)" via e-mail to the supplier system (i.e., IAS). The PAN file announces the completion of data transfer and archival, and identifies any errors or problems that have been encountered. Using the file naming convention depicted in Table 4-20 (an example is provide in Figure 4-11), unique file names (time-based) are assigned to each PAN. There are two forms of the PAN available for use, including a short (Table 4-21) and a long (Table 4-22) form. The short form of the PAN is sent to acknowledge that all files have been successfully transferred, or to report errors which are not specific to individual files but which have precluded processing of any and all files (e.g., FTP failure). If all files in a request do not have the same disposition, a long form of this message is employed. The PAN consists of PVL Statements. Short and long PAN PVL examples are provided, respectively, in Figure 4-12 and Figure 4-13.

Table 4-20. File Naming Convention For Production Acceptance Notification

Field	Description	Format/ Type Max Size (Bytes)	Value
IAS Designation	Designation for IAS	ASCII String (20)	Originating System in IAS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PAN filename	ASCII String (3)	'PAN'

EXAMPLE	EXAMPLE
<p>FILENAME = IAS123.yyyymmddhhmmss.PAN,</p> <p>where</p> <p>yyyymmddhhmmss = date of PDR file creation = 20010719123845,</p>	
EXAMPLE	EXAMPLE

Figure 4-11. Example PAN File Naming Convention

Table 4-21. Short Production Acceptance Notification PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	SHORTPAN
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

Table 4-22. Long Production Acceptance Notification PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Long Production Acceptance Notification	Fixed String/ASCII (7)	LONGPAN
NO_OF_FILES	Number of Files in IAS PDR	ASCII (4)	TOTAL_FILE_COUNT parameter in IAS PDR

For each File in the IAS PDR

FILE_DIRECTORY	ASCII string specifying file directory location	ASCII (<256) Equivalent to IAS PDR length	DIRECTORY_ID parameter in IAS PDR
FILE_NAME	File names on system creating IAS PDR	ASCII (<256) Equivalent to IAS PDR length	FILE_ID parameter in IAS PDR
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of the data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

EXAMPLE ONLY	EXAMPLE ONLY
<pre>MESSAGE_TYPE = SHORTPAN; DISPOSITION = "POST-TRANSFER FILE SIZE CHECK FAILURE"; TIME_STAMP = 1999-06-23T09:46:35Z;</pre>	

Figure 4-12. Example Short PAN PVL

EXAMPLE ONLY	EXAMPLE ONLY
<pre>MESSAGE_TYPE = LONGPAN; NO_OF_FILES = 2; FILE_DIRECTORY = CAL/IAS; FILE_NAME = L71999120IASCAL.A01; DISPOSITION = "UNABLE TO ESTABLISH FTP/KFTP CONNECTION"; TIME_STAMP = 1999-04-28T23:49:59Z; FILE_DIRECTORY = CAL/IAS; FILE_NAME = L71999121IASCAL.A02; DISPOSITION = "ECS INTERNAL ERROR"; TIME_STAMP = 1999-04-29T23:49:59Z;</pre>	

Figure 4-13. Example Long PAN PVL

4.5.5 IAS-ECS Reports

IAS generates four types of reports as a user advisory service; calibration reports, assessments reports, problem reports, and summary reports. Calibration, assessment, and problem reports are created on an as needed basis. Summary reports are generated monthly, quarterly, and annually. The monthly report provides the users with a summary the overall Level OR product quality. The quarterly reports provides a description of the calibration file updates. The annual report describes the general status of the system. Whenever the calibration parameters are updated, IAS generates an advisory report on an as needed basis. IAS provides these reports to ECS via TBR transfer mechanism, and ECS posts these reports on the ECS Document Data Server.

4.5.6 IAS-ECS Electronic Data Exchange Error Handling/Back-up Methods

Exchange of data on physical media is used for data transfer back-up. ECS provides hard media ingest as described in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. The hard media received by ECS must provide information describing the data being transferred. This information is provided in standard PVL form, and relates the same information as provided in the IAS PDR used with the Polling Ingest with PDR process.

During the course of data exchange via FTP, the following typical error conditions may arise:

- a. Failure to establish TCP/IP connection
- b. Erroneous FTP command
- c. File not found (listed in IAS PDR, but not found on disk)
- d. File not readable due to permissions

Should a problem develop during and FTP file transfer due to any of the above error conditions, an operator-tunable number of attempts are made to pull the data. In the event that problems cannot be resolved within this operator-tunable number of attempts, ECS and the IAS operations personnel have the option to coordinate data delivery on a variety of approved high density storage media including the following:

- a. 8 mm tape [112 meters; 5GB standard capacity]
- b. 4 mm digital audio tape (DAT) [90 meters; 2GB standard capacity]

While the use of tape media as a backup is not a requirement, it may be useful during emergencies, and is supported by both ECS and the IAS. In the event that tape media are used during emergencies, a separate Physical Media Product Delivery Record (PMPDR) file must be supplied for each piece of media delivered to ECS. The PMPDR must, both, be contained as a file on the media and be available separately as hard copy---in the event that a file check on the media by ECS reveals that the PMPDR is missing, IAS operations personnel will supply ECS operations personnel with a hard copy PMPDR. The format and information content for the PMPDR is the same as that for the IAS PDR defined in Table 4-15.

Data are distributed uncompressed. The Tar tape format is used---no absolute path is used in the Tar command. Paper labels for each tape identify the names of files contained on the tape and the order in which these files have been written---the use of bar code labeling is optional (TBR). Physical media tapes are to be hand-carried to ECS from IAS on-site at EDC. ECS ingests and archives the IAS data delivered on physical media and received in good condition.

4.5.7 IAS-ECS Electronic Data Exchange Security

The IASs use standard ftp login procedures including the use of a password for the purposes of security. In addition, the IASs will have write access only to the ECS open server.

4.6 Data Exchange Between MMO and ECS

Data Exchanged between MMO and ECS consists of MMO Reports (provided by ECS to MMO), product price information (provided by MMO to ECS), and system management status (provided by ECS to MMO, and by MMO to ECS). MMO Reports contain statistics that are compiled over several separate areas of measured performance as defined in Section 5.5.

The MMO Reports are provided by ECS to MMO through Internet data transfer via an HTTP link---that is, MMO pulls data from ECS Document Data Server. Internet connectivity is addressed in Section 4.2 which describes all of the Internetworking protocols and provides appropriate documentation references.

The L7 price table contains the latest product price information. The Landsat Coordinating Group (made up of senior managers representing the three Landsat Program Management agencies, NASA, NOAA, and USGS) shall reevaluate Landsat 7 data product prices on an annual basis. This review may result in a change in the Landsat 7 price table. Price changes to this table are made in accordance with ESDIS policy and are implemented via the Configuration Change Request (CCR) process. The CCR may be submitted (from MMO to ECS) via various means including e-mail, mail, etc. Only after ESDIS approval do these changes filter down to the Billing and Accounting Maintenance and Operations staff for installation of the price table updates.

4.6.1 Exchange of MMO Reports

ECS provides MMO statistics and reports that are accessed by MMO through an Internet connection over an HTTP link (i.e., MMO uses a Web browser) as depicted in Figure 4-14. The mechanism by which ECS notifies MMO that a report is available on the ECS Document Data Server is TBR.

Connectivity to the ECS Document Data Server for this transfer is an MMO responsibility. All ECS registered users have access to Landsat 7 guide information on the ECS Document Data Server using HTML/HTTP.

4.6.2 Exchange of System Management Status

Exchange of system management status (from ECS to MMO, and from MMO to ECS) is accomplished through e-mail, as depicted in Figure 4-15. The protocol for Internet e-mail transfer is the Simple Mail Transfer Protocol (SMTP) discussed in Section 4.2.4.

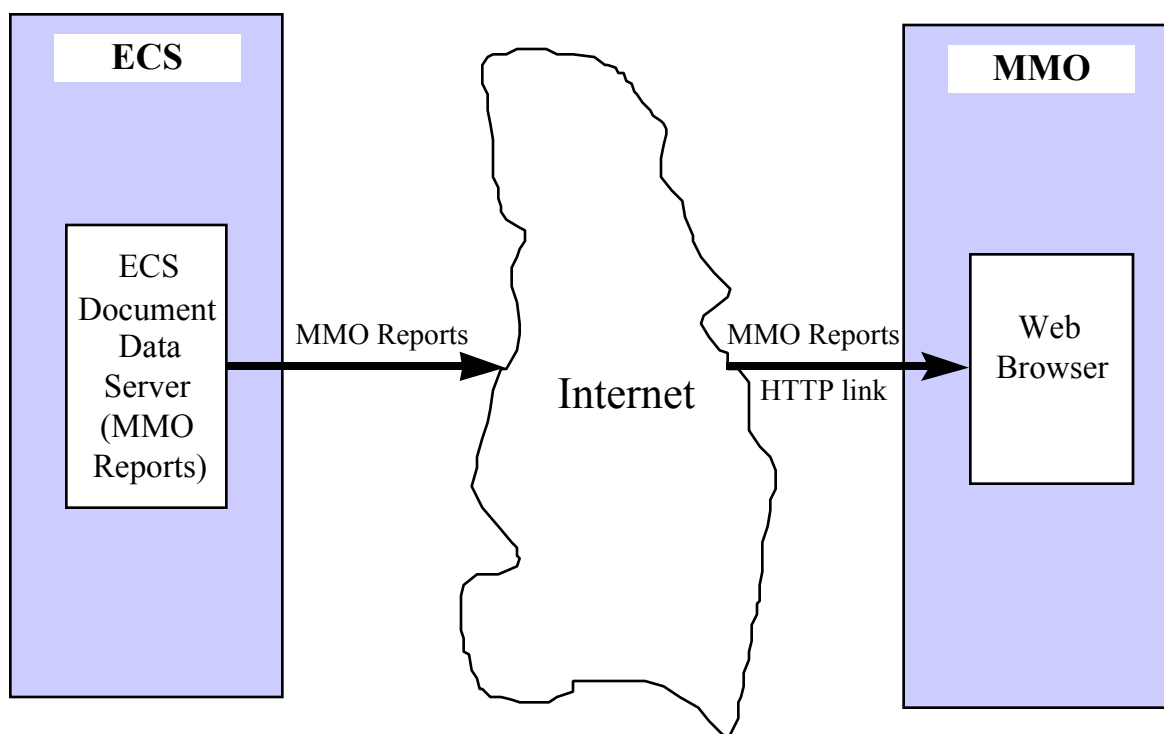


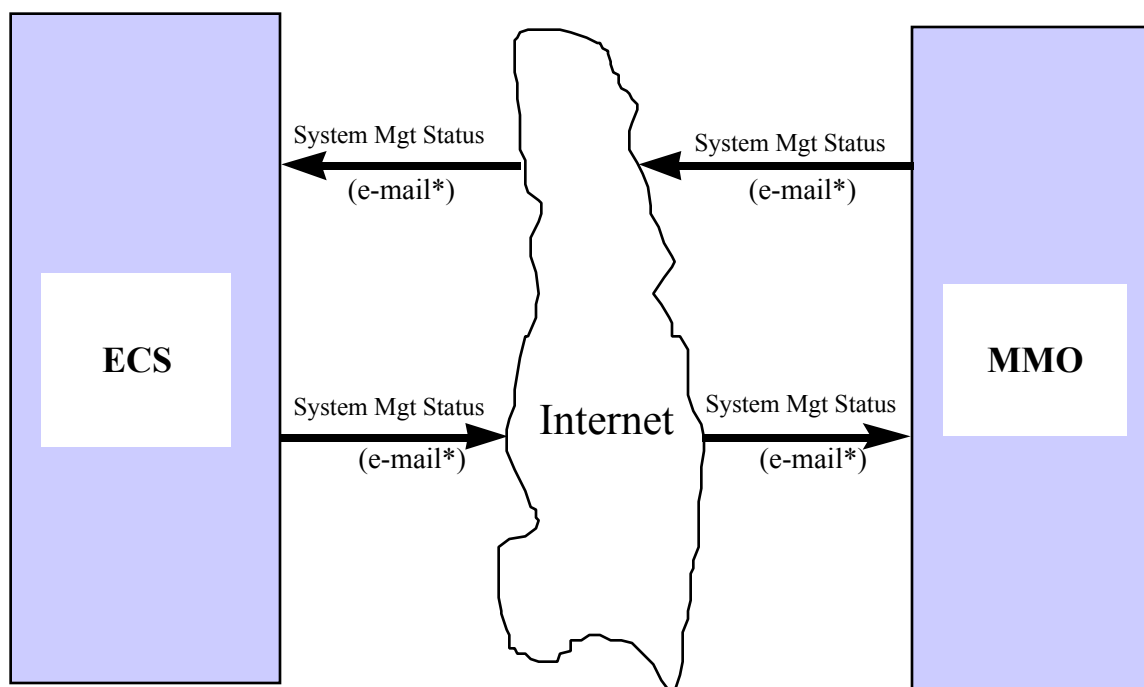
Figure 4-14. MMO Reports Transfer Mechanism

4.7 Data Exchange Between the Landsat 7 IGSs and ECS

The Landsat 7 IGS-ECS interface uses either physical media or automated electronic data exchange to transfer metadata from the IGSs to the ECS. Browse data may also be transferred to the ECS, using physical media and accompanied by the associated metadata. ECS provides hard media ingest as described in the Release B SDPS Ingest Subsystem (INS) Design Specification for the ECS Project. ECS supports ingest from different types of hard media, with 8 mm tape as the standard at EDC. The hard media received by ECS must provide information describing the data being transferred in a standard Physical Media Product Delivery Record (PMPDR) file format. Data products transferred on physical media are to be delivered to ECS via available delivery services; e.g., United States Postal Services, Federal Express, etc. ECS ingests and archives Landsat 7 data delivered on physical media and received in good condition. ECS is not accountable for IGS data that does not arrive at the EDC DAAC nor for monitoring what IGS data should arrive. Automated electronic data exchange is accomplished using the Polling Ingest with Product Delivery Record method.

4.7.1 Physical Media Type

The standard physical media type used for the transfer of data to/from the EDC DAAC is 8 mm cartridge tapes. ECS at the EDC DAAC also supports CD-ROM and 4 mm physical media types.



* System Management Status is sent as an attachment to an e-mail message

Figure 4-15. System Management Status Transfer Mechanism

4.7.2 Physical Media Structure

The physical media standards supported by ECS are based on existing physical media products. The EDC DAAC is compliant with the ANSI and ISO standards for physical and logical file formats for the appropriate physical media. The logical structure for 8 mm tape includes a volume description file containing a list of all files on the tape. The ECS data ingest mechanism requires that a volume description/PMPDR, which describes all files on the media, be provided.

The IGS PMPDR parameter and field descriptions are presented in Table 4-23. This IGS PMPDR, when processed, serves as a DAN for ingesting IGS provided data. There is one IGS PMPDR per tape. The format of the 8 mm tape is a Unix Tar file---no absolute path is used in the Tar command. There is one file group for each data type within the subinterval (for example, one file group for the subinterval's metadata files and one file group for the subinterval's browse files). Similarly, all the File Groups are repeated contiguously for as many subintervals that are recorded on the tape.

Table 4-23. IGS Physical Media Product Delivery Record PVL Parameters

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of Delivery Record	Variable String	ASCII 20B	'IGSxxx' (per station IDs in ICD Between Landsat 7 System and IGSs)
TOTAL_FILE_COUNT	Total number of files	Integer	ASCII 4B	1 - 9999
OBJECT	Start of file group parameters (repeat for each group of files).	Fixed String	ASCII 10B	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII 20B	'IGS_META' for metadata 'IGS_BRWS' for browse
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII 9B	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 2)	This field will be left blank.
FILE_ID	File name	Variable String	ASCII (Note 3)	IGS file name (per naming convention in ICD between Landsat 7 System and IGSs)
FILE_TYPE	File Data Type (must be consistent with data type)	Variable String	ASCII 20B	'Metadata' or 'Browse'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII 10B	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII 9B	'FILE_SPEC'
END_OBJECT	End of file group (repeat for each group of files)	Fixed String	ASCII 10B	'FILE_GROUP'

Note 1. Each IGS must have a unique identifier.

Note 2. Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID.

Note 3. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID.

4.7.3 IGS Physical Media Product Delivery Record

A separate IGS Physical Media PDR (PMPDR) file must be supplied for each piece of media delivered to ECS. The PMPDR must be contained as a file on the media. The IGS PMPDR contains information consistent with the information provided in a DAN (Section 4.4.7). It describes each of the files on the media and other descriptive information. The PMPDR structure is presented in Table 4-23. The PMPDR must, both, be contained as a file on the media and be available separately as hard copy---in the event that a file check on the media by ECS reveals that the PMPDR is missing, IGS operations personnel will supply ECS operations personnel with a hard copy PMPDR. An example IGS PMPDR PVL is provided in Figure 4-16. The file naming convention for the IGS PMPDR is the same as that for the IGS PDR described in section 4.7.4.1. Paper labels for each tape identify the names of files contained on the tape and the order in which these files have been written---the use of bar code labeling is optional (TBR). Following the attempt by ECS to validate the IGS PMPDR, ECS will return a PDRD as

described in 4.7.4 and 4.7.4.2. After ECS has attempted to ingest/archive the data, ECS will return a PAN as described in 4.7.4 and 4.7.4.3.

EXAMPLE ONLY	EXAMPLE ONLY
<pre> ORIGINATING_SYSTEM = IGSKUJ; /* IGS Station at Kumomoto, Japan */ TOTAL_FILE_COUNT = 3; OBJECT = FILE_GROUP; DATA_TYPE = IGS_META; /* Allowed values pre-defined by ECS */ OBJECT = FILE_SPEC; DIRECTORY_ID = ; FILE_ID = L7KUJ111045199910191.MTA; FILE_TYPE = METADATA; /* Allowed values pre-defined by ECS */ FILE_SIZE = 11000; END_OBJECT = FILE_SPEC; OBJECT = FILE_SPEC; DIRECTORY_ID = ; FILE_ID = L7KUJ111045199910192.MTA; FILE_TYPE = METADATA; /* Allowed values pre-defined by ECS */ FILE_SIZE = 11000; END_OBJECT = FILE_SPEC; END_OBJECT = FILE_GROUP; OBJECT = FILE_GROUP; DATA_TYPE = IGS_BRWS; /* Allowed values pre-defined by ECS */ OBJECT = FILE_SPEC; DIRECTORY_ID = ; FILE_ID = L7KUJ11104519991019.R01; FILE_TYPE = BROWSE; /* Allowed values pre-defined by ECS */ FILE_SIZE = 100000; END_OBJECT = FILE_SPEC; ----- /* Repeat FILE_SPEC objects for each IGS data file within file group */ ----- END_OBJECT = FILE_GROUP; ----- /* Repeat FILE_GROUP objects for each different file group */ ----- </pre>	

Figure 4-16. Example PMPDR PVL For IGS Metadata and Browse Files

4.7.4 Electronic Interface For IGS Metadata Exchange

The purpose of the ECS/IGS electronic transfer mechanism is to support the delivery of metadata from the IGS stations to ECS. A Polling Ingest with Product Delivery Record (PDR) mechanism is employed for this purpose. To accommodate this interface, a single server, under ECS administrative control, will be identified on the open side of the ECS firewall; metadata and PDRs will be placed on this open server by all the IGS stations. This implementation of the Polling Ingest with PDR consists of the following steps (see Figure 4-17):

1. IGS places metadata file on open server in specified location -
2. IGS generates PDR; places PDR on open server in known directory -
3. ECS periodically (tunable for each IGS) polls directory on “open” server, and detects/retrieves PDR-

The ECS side of the interface is equipped with an FTP daemon---a computer program which automatically, and with operator-tunable periodicity, polls the “open” server, detects a PDR file via an FTP “-ls” command, and acquires the PDR file information via an FTP “get” command. At the “open” server, an FTP daemon continually listens for incoming FTP requests, acts on each arriving FTP request, and routes each FTP request to the appropriate account, making the directory sub-tree available to ECS with the allowable privileges.

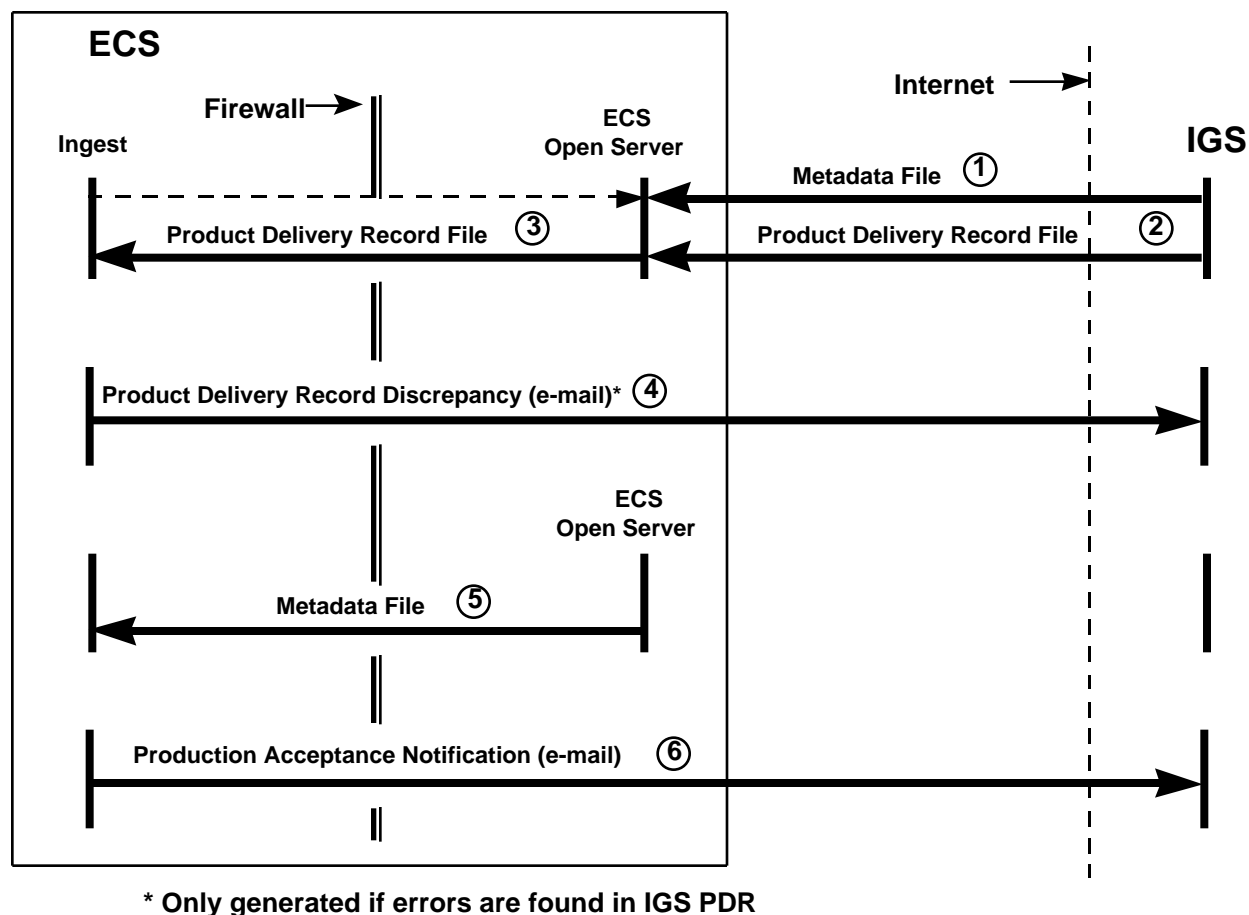


Figure 4-17. IGS/ECS Metadata Transfer Mechanism

4. ECS sends Product Delivery Record Discrepancy (PDRD) to IGS (via e-mail) indicating error/success dispositions for file groups in PDR -

Once a PDR has been detected/acquired by ECS, the PDR is validated. In the event that the PDR is invalid, ECS automatically returns a Product Delivery Record Discrepancy (PDRD), via e-mail, to the supplier system (i.e., IGS), indicating the error/success dispositions for file groups in the IGS PDR resulting from ECS's attempt to validate the IGS PDR. If the PDR is valid, ECS schedules to pull the metadata using an FTP "get" command; in this case no PDRD is sent. If an error is found in the IGS PDR, processing is terminated and none of its files is transferred to the closed server for processing until a corrected IGS PDR is received and successfully processed.

5. ECS pulls the metadata file from the open server for ingest/archive

6. ECS sends a Production Acceptance Notification (PAN) to the IGS (via e-mail) indicating either success or errors found during metadata ingest/archive

Operator tunable parameters for the Polling Ingest with PDR data transfer mechanism include ECS periodicity for polling the ECS “open” server for the IGS PDR. All relevant operator tunable parameters will be identified in the DAAC operations Manual (DID 611)

The Polling Ingest with Product Delivery Record transfer mechanism is fully automated. In the context of this transfer mechanism, this section addresses the PDR, PDRD and PAN. In addition, the error conditions, error handling/backup methods, and physical media are discussed herein.

4.7.4.1 IGS Product Delivery Record

The purpose of the IGS PDR is to announce the availability of metadata for transfer, including file names, file size, location, etc. The IGS PDR is generated and placed in an operator configurable (pre-specified) directory on an operator configurable “open” server (located on the open side of the ECS firewall, but under ECS administrative control) by the system supplying the data (i.e., the IGS station) after the data files referenced in the IGS PDR have been placed into their respective directories. ECS polls the “open” server, detects/acquires/validates the IGS PDR, and schedules to pull the metadata.

The IGS PDR format is comprised of Parameter-Value Language (PVL) Statements. The required IGS PDR PVL parameters are depicted in Table 4-24. The IGS PDR PVL statements are ASCII strings, having at most 256 characters, in the form: "Parameter = Value." The Value strings shown in Table 4-25 include pre-defined values shown by single quote marks and processor determined values which include ASCII strings, ISO times, and integers to be filled in with appropriate values by an IGS System processor during IGS PDR creation. An example IGS PDR PVL is provided in Figure 4-18. The maximum allowed message length for an IGS PDR is 1 megabyte. IGS PDRs are validated to check that all required fields contain valid values and that the format of the IGS PDR is correct and consistent with the standards. IGS PDRs that

Table 4-24. IGS PDR PVL Parameters

Parameter	Description	Type	Format/ Max Size (Bytes)	Values
ORIGINATING_SYSTEM	Originator of Delivery Record	Variable String	ASCII (20)	'IGSxxx' (per station IDs in ICD between Landsat 7 System and IGSs)
TOTAL_FILE_COUNT	Total number of files	Integer	ASCII (4)	1 - 9999 (will be 1 or 2)
OBJECT	Start of file group parameters Repeat for each group of files.	Fixed String	ASCII (10)	'FILE_GROUP'
DATA_TYPE	ECS Data Type	Fixed String	ASCII (20)	'IGS_META' for metadata
NODE_NAME	Name of network node on which the file resides	Variable String	ASCII (64)	e.g., 'metasrv.edc.nasa.gov'
OBJECT	Start of file parameters (repeat for each file in file group)	Fixed String	ASCII (9)	'FILE_SPEC'
DIRECTORY_ID	File directory name (i.e. path name)	Variable String	ASCII (Note 2)	e.g. META/xxx
FILE_ID	File name	Variable String	ASCII (Note 3)	IGS file name (per naming convention in ICD between Landsat 7 System and IGSs)
FILE_TYPE	File Data Type	Variable String	ASCII (20)	'Metadata'
FILE_SIZE	Length of file in bytes	Unsigned 32-bit Integer	ASCII (10)	< 2 GB
END_OBJECT	End of file parameters (repeat for each file)	Fixed String	ASCII (9)	'FILE_SPEC'
END_OBJECT	End of file group Repeat for each group of files.	Fixed String	ASCII (10)	'FILE_GROUP'

Note 1. Each IGS must have a unique identifier (per Landsat 7 To International Ground Station ICD).

Note 2. Size can vary up to 256 bytes total when DIRECTORY_ID is combined with FILE_ID.

Note 3. Size can vary up to 256 bytes total when FILE_ID is combined with DIRECTORY_ID.

adhere to the defined message standards shown in Table 4-24 are accepted and processed. Using the file naming convention depicted in Table 4-25, unique file names (time-based) are assigned to each IGS PDR, so as to avoid potential overwrites. An example of the IGS PDR file naming convention is provided in Figure 4-19.

It is important to note that a FILE_GROUP consists of all files of one DATA_TYPE that compose a granule. (A granule is the smallest aggregation of data that can be inventoried within ECS and ordered from ECS.) All files within a FILE_GROUP are stored together in the ECS archive.

Additional information on PVL can be found in the document entitled, Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book”

EXAMPLE ONLY	EXAMPLE ONLY
<pre> ORIGINATING_SYSTEM = IGSKUJ; /* IGS Station at Kumomoto, Japan */ TOTAL_FILE_COUNT = 2; OBJECT = FILE_GROUP; DATA_TYPE = IGS_META; /* Allowed values pre-defined by ECS */ NODE_NAME = METASRV.EDC.NASA.GOV; OBJECT = FILE_SPEC; DIRECTORY_ID = META/KUJ FILE_ID = L7KUJ111045199910191.MTA; FILE_TYPE = METADATA; /* Allowed values pre-defined by ECS */ FILE_SIZE = 11000; END_OBJECT = FILE_SPEC; OBJECT = FILE_SPEC; DIRECTORY_ID = META/KUJ; FILE_ID = L7KUJ111045199910192.MTA; FILE_TYPE = METADATA; FILE_SIZE = 11000; END_OBJECT = FILE_SPEC; END_OBJECT = FILE_GROUP; </pre>	

Figure 4-18. Example PDR PVL For IGS Metadata Files

Table 4-25. File Naming Convention For IGS Product Delivery Record

Field	Description	Format/ Type Max Size (Bytes)	Value
IGS Station Designation	Designation for potential IGS sites	ASCII String (20)	Originating System in IGS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PDR filename	ASCII String (3)	'PDR'

EXAMPLE ONLY**EXAMPLE ONLY**

FILENAME = IGSxxx.yyyyymmddhhmmss.PDR,
 where
 yyyyymmddhhmmss = date of PDR file creation= 19991020123845,
 and
 xxx = KIJ (i.e., Kumamoto, Japan)

EXAMPLE ONLY**EXAMPLE ONLY****Figure 4-19. Example IGS PDR File Naming Convention****4.7.4.2 Product Delivery Record Discrepancy**

The PDRD is sent by ECS to the supplier system (i.e., IGS), via automatic e-mail, only in the event that the IGS PDR cannot be successfully validated. The PDRD indicates the error dispositions for file groups in the supplier system (i.e., IGS) PDR resulting from ECS's attempt to validate this PDR. An IGS PDR specifies only one file group, which may contain one or two file specs. If an error is encountered in the file group, ECS ceases processing and reports the error which it just encountered in that file group. None of the remaining conditions for that file group is validated. None of the files is transferred to ECS for processing until a corrected IGS PDR is received and successfully processed. Using the file naming convention depicted in Table 4-26 (an example is provided in Figure 4-20), unique file names (time-based) are assigned to each PDRD. There are two forms of PDRD, including a short form (Table 4-27) and long form (Table 4-28). The short form is used for IGS PDRs with errors in the IGS PDR PVL that are not

attributable to the specific file group. The long form is used when the file group in the IGS PDR has invalid parameters. The PDRD consists of PVL Statements. Short and Long PDRD PVL examples are provided, respectively, in Figure 4-21 and Figure 4-22.

Table 4-26. File Naming Convention For Product Delivery Record Discrepancy

Field	Description	Format/ Type Max Size (Bytes)	Value
IGS Station Designation	Designation for potential IGS sites	ASCII String (20)	Originating System in IGS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PDRD filename	ASCII String (4)	'PDRD'

EXAMPLE ONLY

EXAMPLE ONLY

FILENAME = IGSxxx.yyyymmddhhmmss.PDRD,
 where
 yyyymmddhhmmss = date of PDR file creation = 19991020123845,
 and
 xxx = KUJ (i.e., Kumomoto, Japan)

EXAMPLE ONLY

EXAMPLE ONLY

Figure 4-20. Example PDRD File Naming Convention

Table 4-27. Short Product Delivery Record Discrepancy PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Short Product Delivery Record Discrepancy	Fixed String/ASCII (9)	SHORTPDRD
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	"INVALID FILE COUNT" "ECS INTERNAL ERROR" "DATABASE FAILURES" "INVALID PVL STATEMENT" "MISSING OR INVALID ORIGINATING_SYSTEM PARAMETER" "DATA PROVIDER REQUEST THRESHOLD EXCEEDED" "DATA PROVIDER VOLUME THRESHOLD EXCEEDED" "SYSTEM REQUEST THRESHOLD EXCEEDED" "SYSTEM VOLUME THRESHOLD EXCEEDED"

Note 1. In any given instance, only one disposition value is provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter=value statement is followed by an EOL mark.

Table 4-28. Long Product Delivery Record Discrepancy PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Long Product Delivery Record Discrepancy	Fixed String/ASCII (8)	LONGPDRD
NO_FILE_GRP (to follow)	Number of File Groups with Errors	Integer/ASCII (4)	Number of File groups, in IGS PDR, with errors

For each file group having errors in the IGS PDR

DATA_TYPE	ECS Data Type	ASCII String (20)	DATA_TYPE in IGS PDR
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	"SUCCESSFUL" (Note 3) "INVALID DATA TYPE" * "INVALID DIRECTORY" * "INVALID FILE SIZE" "INVALID FILE ID" * "INVALID NODE NAME" * "INVALID FILE TYPE" *

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

* Null string check only

Note 3. This disposition is not exercised for the special case of the IGS/ECS interface.

EXAMPLE ONLY**EXAMPLE ONLY**

MESSAGE TYPE = SHORTPDRD;
DISPOSITION = "INVALID PVL STATEMENT";

Figure 4-21. Example Short PDRD PVL

EXAMPLE ONLY**EXAMPLE ONLY**

MESSAGE_TYPE = LONGPDRD;
NO_FILE_GRP = 1;
DATA_TYPE = IGS_META;
DISPOSITION = "INVALID FILE SIZE";

Figure 4-22. Example Long PDRD PVL

4.7.4.3 Production Acceptance Notification

After the data have been ingested/archived by ECS, ECS automatically sends a "Production Acceptance Notification (PAN)" via e-mail to the supplier system (i.e., IGS station). The PAN file announces the completion of data transfer and archival, and identifies any errors or problems that have been encountered. Using the file naming convention depicted in Table 4-29 (an example is provided in Figure 4-23), unique file names (time-based) are assigned to each PAN. There are two forms of the PAN available for use, including a short (Table 4-30) and a long (Table 4-31) form. The short form of the PAN is sent to acknowledge that all files have been successfully transferred, or to report errors which are not specific to individual files but which have precluded processing of any and all files (e.g., FTP failure). If all files in a request do not have the same disposition, a long form of this message is employed. The PAN consists of PVL Statements. Short and long PAN PVL examples are provided, respectively, in Figure 4-24 and Figure 4-25.

Table 4-29. File Naming Convention For Production Acceptance Notification

Field	Description	Type (Length in Bytes)	Value
IGS Station Designation	Designation for potential IGS sites	ASCII String (20)	Originating System in IGS PDR
PDR Creation Date	Date when PDR was created	ASCII (14)	yyyymmddhhmmss
Filename extension	Extension for file PAN filename	ASCII String (3)	'PAN'

EXAMPLE	EXAMPLE
<p>FILENAME = IGSxxx.yyyymmddhhmmss.PAN,</p> <p>where</p> <p>yyymmddhhmmss = date of PDR file creation = 19991020123845,</p> <p>and</p> <p>xxx = KIJ (i.e., Kumamoto, Japan)</p>	
EXAMPLE	EXAMPLE

Figure 4-23. Example PAN File Naming Convention

Table 4-30. Short Production Acceptance Notification PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Short Production Acceptance Notification Definition	Fixed String/ASCII (8)	SHORTPAN
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

Table 4-31. Long Production Acceptance Notification PVL Parameters

Parameter ²	Description	Type/Format (Length in Bytes)	Value ²
MESSAGE_TYPE	Long Production Acceptance Notification	Fixed String/ASCII (7)	LONGPAN
NO_OF_FILES	Number of Files in IGS PDR	ASCII (4)	TOTAL_FILE_COUNT parameter in IGS PDR

For each File in the IGS PDR

FILE_DIRECTORY	ASCII string specifying file directory location	ASCII (<256) Equivalent to IGS PDR length	DIRECTORY_ID parameter in IGS PDR
FILE_NAME	File names on system creating IGS PDR	ASCII (<256) Equivalent to IGS PDR length	FILE_ID parameter in IGS PDR
DISPOSITION	Disposition of Ingest Request ¹	Variable String/ASCII (64)	One of the following: "SUCCESSFUL" "NETWORK FAILURE" "UNABLE TO ESTABLISH FTP/KFTP CONNECTION" "ALL FILE GROUPS/FILES NOT FOUND" "FTP/KFTP FAILURE" "POST-TRANSFER FILE SIZE CHECK FAILURE" "FTP/KFTP COMMAND FAILURE" "DUPLICATE FILE NAME IN GRANULE" "METADATA PREPROCESSING ERROR" "RESOURCE ALLOCATION FAILURE" "ECS INTERNAL ERROR" "DATA BASE ACCESS ERROR" "INCORRECT NUMBER OF METADATA FILES" "INCORRECT NUMBER OF SCIENCE FILES" "INCORRECT NUMBER OF FILES" "DATA CONVERSION FAILURE" "REQUEST CANCELLED" "UNKNOWN DATA TYPE" "INVALID OR MISSING FILE TYPE" "FILE I/O ERROR" "DATA ARCHIVE ERROR"
TIME_STAMP	ISO Time when Destination System transferred the last part of the data	ASCII (20)	GMT in the format: yyyy-mm-ddThh:mm:ssZ, where T indicates the start of time information and Z indicates "Zulu" time

Note 1. In any given instance, only one disposition value may be provided. In cases where multiple errors have occurred, the disposition value corresponding to the first error encountered will be provided.

Note 2. Each parameter/value statement is followed by an EOL mark.

EXAMPLE ONLY**EXAMPLE ONLY**

```
MESSAGE_TYPE = SHORTPAN;
DISPOSITION = "INCORRECT NUMBER OF METADATA FILES";
TIME_STAMP = 1999-11-03T09:46:35Z;
```

Figure 4-24. Example Short PAN PVL**EXAMPLE ONLY****EXAMPLE ONLY**

```
MESSAGE_TYPE = 'LONG PAN';
NO_OF_FILES = 2;
FILE_DIRECTORY = META/KUJ;
FILE_NAME = L7KUJ1100045199910191.MTA;
DISPOSITION = "UNABLE TO ESTABLISH FTP CONNECTION";
TIME_STAMP = 1999-11-03T23:49:59Z;
FILE_DIRECTORY = META/KUJ;
FILE_NAME = L7KUJ1100045199910192.MTA;
DISPOSITION = "ECS INTERNAL ERROR";
TIME_STAMP = 1999-11-03T23:59:59Z;
```

Figure 4-25. Example Long PAN PVL**4.7.4.4 IGS-ECS Electronic Data Exchange Error Handling/Backup Methods**

During the course of data exchange via FTP, the following typical error conditions may arise:

- a. Failure to establish TCP/IP connection
- b. Erroneous FTP command
- c. File not found (listed in IGS PDR, but not found on disk)
- d. File not readable due to permissions

Should a problem develop during an FTP file transfer due to any of the above error conditions, an operator-tunable number of attempts are made to pull the data. In the event that problems cannot be resolved within this operator-tunable number of attempts, ECS and the IGS operations

personnel have the option to coordinate data delivery on a variety of approved high density storage media including the following:

- a. 8 mm tape [112 meters; 5GB standard capacity]
- b. 4 mm digital audio tape (DAT) [90 meters; 2GB standard capacity]

While the use of tape media as a backup is not a requirement, it may be useful during emergencies, and is supported by both ECS and the IGSs. In the event that tape media are used during emergencies, a separate Physical Media Product Delivery Record (PMPDR) file must be supplied for each piece of media delivered to ECS. The PMPDR must, both, be contained as a file on the media and be available separately as hard copy---in the event that a file check on the media by ECS reveals that the PMPDR is missing, IGS operations personnel will supply ECS operations personnel with a hard copy PMPDR. The format and information content for the PMPDR is the same as that for the IGS PMPDR defined in Table 4-23. The details of physical media submission, described in sections 4.7.1 through 4.7.3, apply to emergency use of tape delivery as well.

4.7.5 IGS-ECS Electronic Data Exchange Security

The IGSs use standard ftp login procedures including the use of a password for the purposes of security. In addition, the IGSs will have write access only to the ECS open server.

4.8 Data Exchange Between the Landsat 7 and the ECS Advertising Service

As a result of having the Landsat 7 inventory metadata available to ECS users through a Science Data Server, the directory level metadata will also be made available to ECS users via the ECS Advertising Service. The Landsat 7 Project first places the directory information on the Global Change Master Directory (GCMD) as a product advertisement. ECS users can search available Landsat 7 directory information, which resides in the in the GCMD, through the ECS Advertising Service interface.

4.9 Data Exchange Between the Landsat 7 and the ECS Document Data Server (TBR)

The Landsat 7 Project (L7) and the EDC DAAC share responsibility for inserting guide information into the ECS Document Data Server. The mechanism for transferring guide data from Landsat 7 to the ECS Document Data Server is TBR.

ECS registered users may access or install documentation information on the ECS Document Data Server using HTML, ASCII, RTF, Postscript, or PDF formats.

4.10 Engineering Data Exchange From the MOC to ECS (TBR)

The MOC provides engineering data, extracted from the Landsat spacecraft housekeeping data stream, to ECS periodically for distribution. The data transfer mechanism for exchanging engineering data is TBR. The characteristics of engineering data are defined in section 5.9.

5. Data Flow Descriptions

Figure 5-1 identifies the data flows between ECS and Landsat 7 Non-user elements. These flows are accomplished by both electronic data exchanges and data exchanges using physical media. Descriptions of the data exchange framework supporting these flows are found in Section 4 of this ICD. Specific characteristics of each direct data flow shown in Figure 5-1 are described in Sections 5.1 through 5.6, including interface methods, data formats, and error handling conditions. Two indirect data flows for Landsat 7, Directory Information and Guide Information, are described in Sections 5.7 and 5.8 respectively.

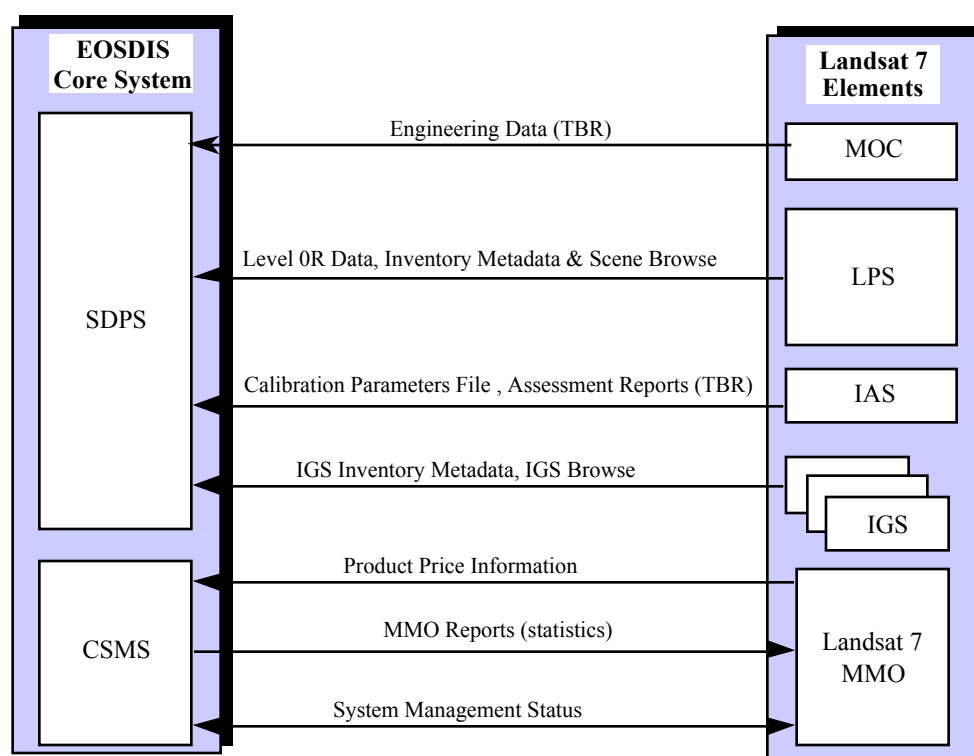


Figure 5-1. Data Flows Between ECS and Landsat 7 Non-user Elements

5.1 Level 0R Data, Inventory Metadata, and Scene Browse

The Level 0R Data interface provides the means for the Landsat 7 Processing System (LPS) to transfer Level 0R processed ETM+ image data, metadata and browse, and the Level 0R support data, in Landsat 7 format-specific data sets to ECS; subinterval data type Format 1 and Format 2. Format 1 and Format 2 data content is described in Table 5-2. Level 0R support data includes Payload Correction Data (PCD), Mirror Scan Correction Data (MSCD), and Calibration/DC

Restore Data. ECS ingests, archives and distributes Landsat 7 Level 0R data to ECS registered users as a service for Landsat 7.

Level 0R data files are transferred electronically from LPS to ECS through the ECS automated network ingest process (Section 4.4.1). This process requires use of control messages and file transfer protocol (ftp). The data files are pulled by ECS from specified LPS processor staging areas. For ECS Release A, LPS early interface testing, this interface is demonstrated by transmitting the control messages required for LPS-ECS file transfer and transferring test files. Transfers of expected operational data volumes and actual Level 0R data files are not planned for ECS Release A.

5.1.1 Level 0R Data Flow Characteristics

ECS is sized to receive up to 140 GB of Level 0R data per day from LPS. The volume is based on 250 scenes (500 MB per scene) per day plus 10% (12.5 GB) for reprocessing. Actual volumes may vary day to day based upon ETM+ instrument contact periods, downlink operations, satellite operations, data capture activities, and scope of data reprocessing.

LPS receives and processes Landsat 7 ETM+ image data as received from real-time data downlink and playback data downlink from the spacecraft. The LPS Operations Concept (560-30CD/0194) details the profile of data capture and processing within LPS. There are from four to six contacts a day, through the Landsat Ground Station, during which, data is recorded in the LPS. Each contact or tape supplies LPS with Landsat 7 format-specific raw data acquired from two X-band downlinks, i.e. real-time and playback, or two playbacks. Nominally, format-specific raw data is directed to different LPS processors. For example, one receives Format 1 real-time data, one receives Format 2 real-time data, one receives Format 1 playback data, and the fourth receives Format 2 playback data. LPS data processing commences after capture for each contact or after ingest of the tapes; processing is suspended during the next capture. Table 5-1 identifies typical daily characteristics for LPS processed data, based on a 16-day operational model run by Lockheed Martin.

Each LPS processor processes the raw data received into separate format-specific subinterval data sets. Each data set is placed in an individual file group (as described in a DAN) for transfer to ECS. For each contact, LPS will create one or more file groups. Each file group relates to a single subinterval. A single subinterval contains at least one WRS scene and at most 37 WRS scenes (including partial scenes). Each LPS processor announces the availability of these file groups with one or more DANs. ECS expects to receive at least 20 DANs a day, one from each LPS Processor per contact period, announcing data for ingest.

Table 5-1. Level 0R Daily Characteristics

Level 0R Characteristic	Average ¹	Maximum	Minimum
Scenes per subinterval	8.5	37 (Note 2)	1
Total Scenes per day ¹	249.75	305	208
Subintervals per day ¹	30.1	41	22

Note 1. Lockheed Martin 16-day analysis includes data downlinked through Alaska and forwarded to LPS at EDC.

Note 2. Including partial scenes

5.1.2 Level 0R Data Format and Contents

Level 0R data files, provided to ECS, are generated on a Landsat 7 subinterval basis; i.e. each file pertains to the entire subinterval, except for the browse files. Browse files are generated on a WRS scene basis. LPS provides the Level 0R data files to ECS in HDF-EOS format. The basis of the HDF-EOS format is a file organization which can support a variety of data models for accessing scientific and related data. HDF-EOS is fully compatible with the Hierarchical Data Format (HDF); HDF-EOS assigns purposes to the HDF models for consistency of use. HDF data types are described in the the following documents.

- HDF-EOS Library User's Guide for the ECS Project, Volume 1: Overview and Examples, Document # 170-TP-005-002
- HDF-EOS Library Users guide for the ECS Project, Volume 2: Function Reference Guide, Document # 170-TP-006-001

Each Landsat 7 Level 0R subinterval data set consists of two format-specific data sets, representing ETM+ Format 1 and Format 2 respectively. Under non-nominal conditions, one of the format-specific data sets may not be available for a particular subinterval. Table 5-2 describes a complete subinterval data set, assuming that both format-specific data sets are delivered for the subinterval. File format and contents for image, calibration, metadata, MSCD, and PCD files are described in the Landsat 7 Processing System (LPS) Output Files Data Format Control Book (DFCB), 514-3FCD/0195. Browse files are described in Section 5.1.7.

5.1.3 Level 0R File Naming Convention

Landsat 7 Level 0R data files received from LPS adhere to the following file naming convention:

L7XsssfnYYDOYHHuuv.xxxwhere:

- **L7** = Indicates the Landsat 7 mission
- **X** = Landsat 7 X-bands 1,2, or 3
- **sss** = Identifies Landsat 7 ground station (e.g., EDC - Sioux Falls, AGS - Fairbanks Alaska, SGS - Svalbard)
- **f** = Landsat 7 Data Format (1 or 2)
- **n** = LPS Processor Number (1 through 5)

Table 5-2. Level 0R Subinterval Data Set

Subinterval Type	Component Name	Number of Files	HDF-EOS Model	Max Size (per file)
Format 1	Image Band 1	1	Swath	1.206 GB
Format 1	Image Band 2	1	Swath	1.206 GB
Format 1	Image Band 3	1	Swath	1.206 GB
Format 1	Image Band 4	1	Swath	1.206 GB
Format 1	Image Band 5	1	Swath	1.206 GB
Format 1	Image Band 6	1	Swath	301 MB
Format 1	Internal Calibration	1	Swath	940 MB
Format 1	Metadata	1	P=V Metadata	10.9 KB (Note 1)
Format 1	MSCD	1	Science Data Table	70.5 KB
Format 1	PCD	1	Science Data Table	420 KB
Format 1	Scene Browse	1 to 37 (Note 4)	Raster Image (Note 2)	185 KB
Format 2	Image Band 6	1	Swath	301 MB
Format 2	Image Band 7	1	Swath	1.206 GB
Format 2	Image Band 8 (Note 3)	1 to 4	Swath	4.822 GB
Format 2	Internal Calibration	1	Swath	940 MB
Format 2	Metadata	1	P=V Metadata	10.9 KB (Note 1)
Format 2	MSCD	1	Science Data Table	70.5 KB
Format 2	PCD	1	Science Data Table	420 KB

Note 1. Derived from LPS DFCB metadata file specification for a 37-scene subinterval (including partial scenes).

Note 2. HDF Browse files are JPEG compressed. (Joint Photographic Expert Group)

Note 3. The LPS metadata file provides a total count of all Level 0R files for Format 2 data. Each band 8 file segment (<2GB) is counted as one UNIX file.

Note 4. Including partial scenes

- **YYDOYHH** = L7 Contact Date and Time, where
 - * **YY** = Year associated with contact
 - * **DOY** = Day of year associated with contact (001-366)
 - * **HH** = Hour of contact within 24 hour day (00-24)
- **uu** = Subinterval Sequential Number within this contact period (01-99)
- **v** = Indicates data set version number:
 - * **v** = 0 For original/first time processed data
 - * **v** = 1 - 9 for reprocessed data
- **xxx** = Indicates LPS file type

- * **xxx** = B is for band files where:
B indicates a "Band File",
i indicates Band IDs 1 - 8 for image bands 1 - 8
s indicates file segment number:
 s = 0 for one file segment only,
 s = 1 - 4 for Pan Band file segments
- * **CAL** = Calibration File
- * **MTA** = Metadata File
- * **PCD** = Payload Correction Data File
- * **MSD** = Mirror Scan Correction Data File
- * **Rnn** = Scene Browse File with Scene Number (01 to 37)

Table 5-3 provides a file naming example for two format-specific data sets (having file sizes approximately equal to 2 GB and 0.9 GB, respectively) which are delivered from different LPS processors (e.g. LPS1 and LPS2). The two format-specific data sets relate to the same subinterval. File names are based upon a contact via X-Band 2 received in Sioux Falls, South Dakota, on November 8, 1998, ~18:40, assuming the subinterval has 10 scenes:

Table 5-3. LPS Level 0R File Naming Example

Format 1 Data Set	Format 2 Data Set
L72EDC119831218020.B10	L72EDC229831218020.B60
L72EDC119831218020.B20	L72EDC229831218020.B70
L72EDC119831218020.B30	L72EDC229831218020.B81
L72EDC119831218020.B40	L72EDC229831218020.B82
L72EDC119831218020.B50	
L72EDC119831218020.B60	L72EDC229831218020.MTA
L72EDC119831218020.MTA	L72EDC229831218020.CAL
L72EDC119831218020.CAL	L72EDC229831218020.PCD
L72EDC119831218020.PCD	L72EDC229831218020.MSD
L72EDC119831218020.MSD	
L72EDC119831218020.R01	
L72EDC119831218020.R02	
L72EDC119831218020.R03	
L72EDC119831218020.R04	
L72EDC119831218020.R05	
L72EDC119831218020.R06	
L72EDC119831218020.R07	
L72EDC119831218020.R08	
L72EDC119831218020.R09	
L72EDC119831218020.R10	

5.1.4 Level 0R Metadata

Level 0R metadata are used to populate the ECS database to be searched and sorted and used to differentiate and identify which Level 0R products are of interest to users. Level 0R metadata are also used to provide basic information required to link related Level 0R file groups (Format 1 and Format 2) and to subset the subintervals into scene-based products. The Level 0R metadata parameters are defined in the LPS Output Files DFCB, 514-3FCD/0195---LPS metadata file format conforms to Object Description Language (ODL).

During ingest and insert to archive, ECS performs metadata parameter checking and extracts Level 0R metadata to populate the ECS Database for each archived subinterval. Appendix C lists all of these Level 0R metadata fields that are extracted and examined by ECS for parameter validity checks and product searches. Values/valid ranges for these parameters are defined in the LPS DFCB, 514-3FCD/0195. ECS augments the Level 0R metadata in the ECS Database with those ECS core metadata attributes required for control of the data in support of archive and distribution functions.

5.1.5 Level 0R Data Transfer Method

Each Level 0R Data transfer is initiated by the transmission of an LPS DAN as described in Section 4.4.7. An Authentication Request (Section 4.4.5) precedes the DAN to establish a TCP socket connection (see 4.4.3). Exchanges of DAN messages must be consistent with the control message sequence described in Section 4.4.3. Each DAN identifies one or more file groups that are available for transfer. The LPS DAN serves as the stimulus to initiate ECS automated network file transfer as described in Section 4.4.1. Under normal expected operating conditions, LPS sends and ECS receives 24 or more DANs during each 24-hour period.

The Level 0R file groups are transferred electronically using the LPS LAN-to-ECS LAN data exchange set-up described in Section 4.1.1 and the ftp data exchange protocol described in Section 4.2.3. Level 0R file transfer requires operationally available LANs for the EDC DAAC and for LPS which are appropriately connected to the interface equipment (Section 4.1.1). Level 0R file transfer is preceded by a DAA which identifies which file groups have been approved for transfer.

Level 0R file transfer is concluded by LPS receipt of the ECS Acknowledgment, which is the Data Delivery Notice (DDN) control message, described in Section 4.4.9. The DDN provides notice of completion of file transfer and data archive. Once LPS receives a successful DDN, the LPS copy of the Level 0R data may be deleted (subject to the expiration time specified in the DAN). Each DDN receives a DDA response (Section 4.4.10) from LPS after which time ECS terminates the session.

5.1.6 Level 0R Data Transfer Error Handling

Error #1 - Post-ftp File Disconnects: If ECS identifies file errors in post-ftp check of the transferred file groups, the DAN or files covered by the DAN are deemed to be invalid. Only those file groups defined by the DAN that are transferred without error are forwarded for ingest and archive. The ECS DDN response identifies file errors. Those file errors must be corrected and a new DAN issued for the corrected file groups, prior to retransfer.

Error #2 - ECS Ingest Process Abort During File Transfer: If there is an ECS system failure during file transfer that suspends file transfer, file transfer is started from the point of the last successful file transfer after problem correction. ECS continues to process against the original DAN after problem correction. If the DAN information has been lost due to the system failure, an ECS operator requests that the DAN be resent.

Error #3 - Invalid Message Format/Contents: If ECS issues a DDN with erroneous information (e.g. invalid DAN_SEQ_NO), the LPS processor receiving the DDN rejects the DDN and flags the error for the LPS operator. The LPS operator must notify the ECS operator of the error.

Error #4 - LPS Failure After DAN Transmission: If ECS is unable to access the files after DAN processing and DAA transmission due to LPS downtime, ECS issues a DDN indicating an FTP failure.

Error #5 - System Failure After DDN Transmission and Receipt: If an LPS has failed prior to issuing the DDA response to a DDN, the LPS operator must notify ECS of the DDN receipt. If ECS has failed so that LPS is unable to send the DDA, the LPS operator must notify ECS of the inability to transmit after the specified number of attempts have occurred.

5.1.7 Browse Files

Multiband-scene browse files are L0R band/images which have been reduced in size (i.e., reduced volume). Browse images are generated, and can be viewed, on a WRS scene basis. These images can be used to determine general ground coverage as well as the spatial relationships between ground area coverage and cloud coverage. Multiband-scene browse files are formed exclusively from Format 1 L0R data---specifically, from three predetermined bands selected from among bands 1 through 5. For each of the full resolution WRS scenes contained in the three selected band files corresponding to a given subinterval, the LPS generates a multiband-scene browse file. Browse files are described in detail in the Landsat 7 Processing System (LPS) Output Files Data Format Control Book (DFCB), 514-3FCD/0195.

5.2 IAS Calibration Parameters File and Reports

The IAS provides calibration parameter files (CPF) to ECS to be ingested/archived, and reports for posting, by ECS, on the ECS Document Data Server. The CPF is packaged with each outgoing L0R product and is used by end users to radiometrically and geometrically correct ETM+ data during higher level processing. The CPF is IAS-generated and is distinct from the LPS-generated calibration image data that is output by the LPS together with each L0R product.

Each CPF can apply to many sets of Landsat 7 Level 0R data. A single file applies to both Format 1 and Format 2 file groups relating to the same subinterval. The applicability of the CPF to the Level 0R subintervals within the ECS archive and those not yet received is based on an IAS-specified beginning and ending effectivity dates which are listed as the first two parameters in the file. Each time a new CPF is received by ECS a metadata update is performed by converting the effectivity ending date of the previous CPF to the release date of the newest set of parameters. In this way a series of CPFs that correspond to discrete but continuous time periods over the Landsat-7 mission is established.

To link a particular CPF to a distribution product, potential effectivity date ranges are compared to the Subinterval Start Time as identified in the metadata provided for each subinterval. The CPF that accompanies an order has an effectivity date range that includes the acquisition date of the image ordered.

IAS provides the CPFs to both ECS and LPS for synchronized implementation. Under nominal conditions the CPF used by LPS for L0R processing and the CPF supplied with the distribution product will be one and the same. The IAS CPF and associated report are provided to ECS on an as needed basis. The frequency is expected to be once every three months on the average. Actual frequency of delivery depends on instrument performance and associated data quality as assessed by IAS. Each file has a volume on the order of 1 MB. Summary reports are generated monthly, quarterly, and annually.

5.2.1 IAS Calibration Parameters File and Reports Format and Content

The CPF is provided to ECS in ODL. The header record provided with the table contains the metadata relating the applicability of the file to the archived Level 0R subintervals. The specific format and contents of the IAS CPF is defined in the Landsat 7 Calibration Parameter File Definition, 430-15-01-002-0. Reports are free text documents placed on the ECS Document Data Server through a web interface in PDF formatted text.

5.2.2 IAS Calibration Parameters File and Reports Transfer Method

The IAS provides the CPF and reports to ECS via an electronic interface. Specifically, a Polling Ingest with PDR mechanism is used for transferring the CPF---the mechanism for transferring reports to the ECS Document Data Server is TBR. The IAS places the CPF and PDR files on an “open server,” which is located on the open side of ECS’s firewall, but is within ECS’s administrative control. ECS polls the open server and detects/pulls/validates the PDR. If any errors are detected in the PDR, ECS returns a PDRD (via e-mail) to the IAS---the PDRD is not sent if the PDR is error-free. ECS ftps the data files (Section 4.2.3) from the “open server.” After attempting to ingest/archive the data, ECS returns a PAN, indicating that the ingest/archive process has been successful, or identifying any errors encountered. The polling ingest with PDR process is discussed in further detail in Section 4.5.1.

5.2.3 IAS Calibration Parameters File and Reports Transfer Errors

Interchange regarding exchange errors (file transfer, erroneous PDR information) is handled through the PDRD (for errors associated with PDR file transfer and validation) and PAN (for errors associated with CPF/reports file transfer and ingest/archive). Inability to transmit and other communication related errors may require IAS to contact the ECS Shift Supervisor who will, in turn, delegate the problem resolution to a member of the shift staff.

5.3 IGS Inventory Metadata and Browse

The Landsat 7 International Ground Stations provide the ECS with inventory metadata and browse for IGS Landsat 7 data holdings. At least 16 IGSs may participate. This collection of stations is expected to generate metadata and browse, related to approximately 575 scenes per day, at a rate of 2 GB/day. ECS provides the capability for Landsat 7 users to search for these data by furnishing access to the IGS provided metadata and browse. Landsat 7 users submit product orders for IGS resident data directly to the IGS, which then delivers these products directly to the Landsat 7 user.

IGS metadata can arrive electronically daily in addition to having IGS inventory metadata and browse products arrive at least quarterly (TBR) on physical media. ECS receives, ingests and archives what is delivered. IGS monthly data transfer to ECS is expected to be approximately 60 GB of data, or 3.75 GB per station. Each station delivers one cartridge tape per month for a total of 16 cartridge tapes per month for the 16 stations. ECS can handle multiple tapes if needed.

5.3.1 IGS Metadata and Browse Format and Content

The standard format for IGS metadata and browse are defined in the Landsat 7 to International Ground Station (IGS) Interface Control Document, document # 430-11-06-009. The ICD identifies the file naming conventions for each IGS and the file contents. IGS files are named according to a mission-specific file naming convention.

5.3.2 IGS Metadata and Browse Transfer Methods

The Landsat 7 IGSs have the capability of using both electronic means and physical media for delivering IGS metadata to be ingested/archived by ECS at the EDC DAAC. The metadata/browse delivery on hard media for the ingest replaces metadata which has been received earlier, via electronic means, by the EDC DAAC.

For electronic data transfer, the IGS provides metadata to ECS using the polling ingest with PDR process. All of the IGS stations place their metadata and PDR files on a single “open server,” which is located on the open side of ECS’s firewall, but is within ECS’s administrative control. ECS polls the open server and detects/pulls/validates the PDR. If any errors are detected in the PDR, ECS returns a PDRD (via e-mail) to the IGSs---the PDRD is not sent if the PDR is error-free. ECS ftps the data files (Section 4.2.3) from the “open server.” After attempting to ingest/archive the data, ECS returns a PAN, indicating that the ingest/archive process has been successful, or identifying any errors encountered. The polling ingest with PDR process is discussed in further detail in Section 4.7.4.

Hard media delivery and ingest is described in section 4.7. Data products transferred on physical media are to be delivered to ECS via available delivery services; e.g., United States Postal Services, Federal Express, etc. ECS ingests and archives Landsat 7 data delivered on physical media and received in good condition.

5.3.3 IGS Metadata and Browse Transfer Errors

ECS verifies that the number of records is correct, checks format and verifies that the number of bits is correct. IGS browse quality assurance is done by IGSs. The EDC DAAC User Services Group serves as the initial point of contact for users reporting quality assurance problems, and for any other issues related to IGS products. The EDC DAAC User Services Group, in collaboration with the Landsat 7 Mission Management Office (MMO), manages the resolution of these problems/issues.

5.4 Product Price Information

The (MMO) provides to ECS product price information for Landsat 7 products (described in Appendix B). Price information is generally provided on a per product basis. For products that vary in size and content (e.g., the partial subinterval), product price relationships are provided that enable ECS to determine product price on the basis of order components and volume. The Product Price information is provided at the commencement of the Landsat Mission. Changes to the price information are made on an as-needed basis in accordance with ESDIS policy, and are submitted to ECS by MMO in the form of a CCR, after coordination with ESDIS.

The product price information is delivered either by mail or over an Internet connection between MMO and ECS as tab-delimited text file attached to an e-mail message. MMO to ECS transfer of e-mail uses SMTP, per RFC 821.

5.5 Statistics and Reports (TBR)

The requirement for statistics and reports, provided by ECS to the Landsat 7 MMO, is defined in the ECS/Landsat 7 Interface Requirements Document, 505-41-13. ECS provides statistics and reports to MMO via an Internet connection. Various statistics are generated over several areas of measured performance. Specific types of reports/attributes, and the frequency of generation/distribution are TBR. The mechanism for transferring reports is described in Section 4.6.1. ECS also provides e-mail to operations personnel and other users to exchange request and status information relating to distribution. File naming convention for MMO Reports is TBD.

5.6 System Management Status

The purpose of this interface is for Landsat 7 MMO to notify ECS or ECS to notify MMO of any problems that may impact ingest, archive and distribution operations. Status information is delivered over an Internet connection between MMO and ECS as Internet e-mail messages. MMO to ECS transfer of e-mail uses SMTP, per RFC 821.

5.7 Landsat 7 Directory Information

Landsat 7 (i.e., LPS, IGS) directory information provides descriptive information of the Landsat 7 Mission, participating agencies, contact references, etc. Both Landsat 7 and ECS provide services to make this data available to ECS registered users.

The Landsat 7 (i.e., LPS, IGS) Science Team and the EDC DAAC share responsibility for placing Landsat 7 directory information on the Global Change Master Directory (GCMD)---ECS provides access to the Landsat 7 directory information in the GCMD via the ECS Advertising Service. The format of the directory information is HTML document files. Landsat 7 Directory Information is a Landsat 7 independent data flow, outside of the ECS-Landsat 7 interface. Files are transferred to the GCMD by Landsat 7. Failure to transfer the appropriate files prevents data availability to the users. Update and maintenance of the Landsat 7 directory information is a Landsat 7 Science Team responsibility.

ECS registered users may access the Landsat 7 directory information on the ECS Advertising Service using the HTML/ HTTP.

5.8 Landsat 7 Guide Information

Landsat 7 (i.e., LPS, IGS) guide information provides descriptive information of the source, scope and composition of Landsat 7 Level 0R data, list of available reports with associated sources, and instructions on how to interpret and manipulate Landsat 7 products acquired. Both Landsat 7 (i.e., LPS, IGS) and ECS provide services to make this data available to ECS registered user of Landsat 7 data.

The Landsat 7 (i.e., LPS, IGS) Science Team and the EDC DAAC share responsibility for developing Landsat 7 guide information and placing it on the ECS Document Data Server. The format of the guide information is HTML document files. Landsat 7 guide information is a Landsat 7 independent data flow, outside of the ECS-Landsat 7 interface. The method of transferring files to the ECS Document Data Server by Landsat 7 is TBR. Failure to transfer the appropriate files prevents data availability to the users. Update and maintenance of the Landsat 7 guide information is a Landsat 7 Project responsibility.

ECS registered users may access the Landsat 7 guide information on the ECS Document Data Server using the HTML/HTTP.

5.9 MOC Engineering Data

The Mission Operations Center (MOC) provides engineering data, extracted from the Landsat spacecraft housekeeping data stream, to ECS periodically for distribution. The product name, file name, frequency, file size, volume, format, and ECS Data Type are identified in Table 5-4.

Table 5-4. MOC Engineering Data

Product Name	File Name	Frequency (Files/day)	File Size (KB/file)	Volume (KB/day)	Format	ECS Data Type
TBD	TBD	8	80	640	TBD	ENG_DATA

Appendix A. Work-off Plan for ECS-Landsat 7 ICD

Table A-1. Work-off Plan for ECS-Landsat 7 ICD (1 of 2)

ICD Issue #	ICD Para. #	Issue Priority	ICD Issue Type & Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	4.6 5.5 Fig 5-1	A	MMO reports are composed and posted by ECS which notifies MMO of availability. Report attribute details to be worked.	ESDIS will coordinate meetings between ECS and Landsat MMO to discuss, in detail, the reports attributes	5/31/97	2. Interface design will be incomplete.
2	3.2.1 5.4	A	Details related to ECS support of product billing/pricing to be worked.	ESDIS will coordinate meetings between ECS and L7 MMO to work out/agree on specifics.	5/31/97	2. Interface design will be incomplete.
4	4.9 4.5.1 4.5.5 5.2.2 5.8	A	Details related to L7/ECS interface for inserting guide data into (placing IAS reports onto) ECS Document Data Server need to be defined.	ESDDIS will coordinate meetings between ECS L7 MMO and IAS to work out/agree on specifics.	6/30/97	2. Interface design will be incomplete.
5	4.10 Tbl 1-1	A	Details related to interface for engineering data exchange between MOC and ECS need to be defined (e.g., data transfer mechanism, characteristics of engineering data, etc.)	ESDIS will coordinate meetings between the MOC, the user(s) and ECS to work out/agree on specifics.	6/30/97	2. Interface design will be incomplete.
6	App C	B	Details of LOR Metadata Parameter Checking and Search Criteria need to be finalized.	ECS to coordinate with L7 Project, IGSS and ESDIS to finalize metadata parameter checking and search criteria.	6/30/97	2. Schedule for completion of interface design may be affected

Table A-1. Work-off Plan for ECS-Landsat 7 ICD (2 of 2)

ICD Issue #	ICD Para. #	Issue Priority	ICD Issue Type & Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
7	4.4.7	A	Need to clarify whether LPS needs to support concurrent FTP for all/some files in file groups associated with a DAN.	ECS to coordinate with LPS/EDC to clarify issue.	5/31/97	2. Interface Design will be incomplete.
8	4.4.3	A	ECS Ingest sends DDNs asynchronously to the L7/ECS Gateway; which sends these DDNs synchronously to LPS processor via single connection. Neither Ingest nor the Gateway is set up to queue DDNs. So there is a mismatch on either side of the GW.	ECS/LPS to coordinate (with ESDIS participation) to decide whether Ingest or the Gateway should implement queuing of DDNs (per ICD); or if LPS should modify its design to handle DDNs asynchronously.	5/31/97	2. Interface Design will be incomplete.
9	4.5.6 4.7.3 4.7.4	B	IGS stations have the option of using bar code labeling for tape media. Details to be worked.	ECS/IGS to coordinate (with ESDIS participation) to work the specifics related to use of bar code labeling.	12/31/97	2. Schedule for completion of interface design may be affected

* Issue Priority Categories:

A = Design impact; e.g., an unresolved interface.

B = Minimal design impact; e.g., content or format of a specific field unresolved.

C = No design impact - administrative detail; e.g., reference document number is not available.

** Risk Assessment Definition:

2 - Risk if issue is not resolved by projected resolution date

Appendix B. Landsat 7 Distribution Products

Landsat 7 data products may be ordered from the ECS archive on a subinterval basis, a Worldwide Reference System (WRS) scene basis, or a partial subinterval (i.e., floating block) basis. Ancillary data required for processing accompanies the image data or may be ordered separately. The ECS distribution process provides scene subsetting of Landsat 7 image band data, calibration data, and mirror scan correction data (MSCD). For the purposes of this description, "Format 1, Format 2 and L7 Format" are distinguished from general references to "format" as it relates to file contents and structure (ASCII, HDF, etc.). L7 data sets are identified in Table B-1.

B.1 Landsat 7 Data Product Distribution Format

The standard distribution format for Landsat 7 OR products available from ECS is HDF. HDF data types are described in Landsat 7 OR Distribution Product Data Format Control Book, Volume 5, 430-11-06-007-0.

B.2 Landsat 7 Subinterval Data Product

A user may order Landsat 7 data on a subinterval basis. The standard Landsat 7 subinterval data product consists of both Landsat 7 Format 1 and Format 2 file groups relating to the same subinterval. In cases where both Landsat 7 Formats do not exist or were not provided to ECS for archive, archived subinterval data with only one available L7 Format may still be acquired. However, if only Format 2 data exists, the distributed metadata file will not include cloud cover assessment (CCA) data nor will any browse be available. These data are only available from the Format 1 file group.

A full subinterval product includes all nine subinterval image bands and all associated data files for both L7 Formats. Subinterval-based products are distributed in the product format, which is the same file format as they were received from LPS. A user may order a full subinterval product or select only certain subinterval image bands and/or calibration files. Image band products include corresponding L7 Format specific calibration data, metadata, MSCD, and PCD in addition to the selected bands. The applicable IAS-provided calibration parameter file is included with the order. Table B-1 lists the files distributed by ECS in response to an order for a full subinterval.

Table B-1. Landsat 7 Full Subinterval Products

Archive Granule	Data Content	Number of Files
Subinterval Format 1	Image Band 1	1
	Image Band 2	1
	Image Band 3	1
	Image Band 4	1
	Image Band 5	1
	Image Band 6 - Gain State 1	1
	Internal Calibration	1
	Metadata	1
	MSCD	1
	PCD	1
Subinterval Format 2	Image Band 6 - Gain State 2	1
	Image Band 7	1
	Image Band 8 (Note 1)	1-3
	Internal Calibration	1
	Metadata	1
	MSCD	1
	PCD	1
Ancillary Data	Calibration Parameters	1
Total Files	Full Subinterval	Up to 20

Note 1. 1 header File with up to 3 binary files for Band 8 subinterval files which exceed 2 GB in volume.

B.3 Landsat 7 Scene Data Product

A user may order Landsat 7 data on a scene basis, where a Landsat 7 scene is defined according to the Landsat 4/5 worldwide reference system (WRS). Each WRS scene as identified by the LPS-provided Landsat 7 metadata includes scene overlap. The standard Landsat 7 scene data product consists of data from both Format 1 and Format 2 file groups related to the same subinterval. In cases where both Landsat 7 Formats do not exist or were not provided to ECS for archive, scene data may still be acquired from the archived subinterval data with only one available L7 Format. However, if only Format 2 data exists, distributed products will not include CCA data nor any browse. These data are only available from the Format 1 file group.

A full scene product includes WRS scene data subset from all nine subinterval image bands, both calibration files, the MSCD, metadata extracted from the ECS database, and the PCD. A user may order a full scene product or select certain image bands as desired. The calibration parameter file is included with the order.

Table B-2 lists the files/data distributed by ECS in response to an order for a full WRS scene. Corresponding scene-based browse file and the IAS-provided calibration parameter file are delivered as separate files with the order.

Table B-2. Landsat 7 Full Scene Products

Archive Granule	Data Content	Product Parts
Subinterval Format 1	Image Band 1	1 Scene
	Image Band 2	1 Scene
	Image Band 3	1 Scene
	Image Band 4	1 Scene
	Image Band 5	1 Scene
	Image Band 6	1 Scene
	Internal Calibration	1 Equiv. Scene
	Metadata	Extracted Database Data or Subinterval File Data
	MSCD	1 Scene
	PCD	Subinterval File Data
Subinterval Format 2	Image Band 6	1 Scene
	Image Band 7	1 Scene
	Image Band 8	1 Scene
	Internal Calibration	1 Equiv. Scene
	Metadata	Extracted Database Data or Subinterval File data
	MSCD	Partial Subinterval File Data
	PCD	Subinterval File Data
Ancillary Data	Calibration Parameters	Acquisition Specific by Date
Total Files	Full WRS Scene	Up to 19 Files

B.4 Landsat 7 Partial Subinterval Data Product

ECS shall be capable of distributing a variably sized Level 0R subset of image data dimensioned according to standard WRS scene width, equal or greater than 1 and up to an entire subinterval in length, and positioned at any scan line starting point within a sub-interval. Subsetting is based primarily on two dimensional geographical coordinates which translate to a starting scan line and a stopping scan line. It should be noted that a subsetted image will contain complete scans (e.g., if a band has 16 detectors, the number of data lines in the subsetted image will be a multiple of 16). Partial scenes at the beginning and end of the subinterval may be included. Table B-3 lists the files distributed by ECS in response to an order for a partial subinterval (i.e., floating block).

Table B-3. Landsat 7 Partial Subinterval Products

Archive Granule	Data Content	Product Parts
Subinterval Format 1	Image Band 1	1 Equiv. Partial Subinterval
	Image Band 2	1 Equiv. Partial Subinterval
	Image Band 3	1 Equiv. Partial Subinterval
	Image Band 4	1 Equiv. Partial Subinterval
	Image Band 5	1 Equiv. Partial Subinterval
	Image Band 6	1 Equiv. Partial Subinterval
	Internal Calibration	1 Equiv. Partial Subinterval
	Metadata	Subinterval File Data
	MSCD	Partial Subinterval Data
	PCD	Subinterval File Data
Subinterval Format 2	Image Band 6	1 Equiv. Partial Subinterval
	Image Band 7	1 Equiv. Partial Subinterval
	Image Band 8	1 Equiv. Partial Subinterval
	Calibration	1 Equiv. Partial Subinterval
	Metadata	Subinterval File Data
	MSCD	1 Scene
	PCD	Subinterval File Data
Ancillary Data	Calibration Parameters	Acquisition Specific by Date
Total Files	Full Partial Subinterval	TBR Up to 19 Files

B.5 Landsat 7 Non-Image Data Products

Non-image data products may be ordered separately. ECS distributes these products in their archive file format, which is the same file format/structure as they were received from each Landsat 7 data provider. Non-image Landsat 7 products that may be ordered are:

- a. Subinterval Metadata Files
- b. PCD Files
- c. MSCD Files
- d. Calibration Parameter Files

Appendix C. Level 0R Metadata Parameter Checking and Search Criteria

During ingest and insert to archive, ECS performs metadata parameter checking and extracts Level 0R metadata to populate the ECS Database for each archived subinterval. Table C-1 lists only the Level 0R metadata fields that are validity checked and those that are used for product searches. Values/valid ranges for these parameters are defined in the LPS DFCB, 514-3FCD/0195.

Table C-1. Landsat-7 L0R LPS/IGS Metadata Attributes Mapped To ECS (1 of 5)

LPS Metadata File Attribute	ECS Parameter Checking	ECS Searchable	ECS Attribute
METADATA FILE INFO			
FILE_NAME	Yes	viewable	(product specific)
FILE_CREATION_DATE_TIME	No	No	
FILE_VERSION_NO	Yes	No	ReprocessingActual
STATION_ID	No	Yes	(product specific)
SOFTWARE_VERSION_NO	No	No	PGEVersion
L7_CAL_PARAM_FILE_VERSION_NO	No	No	
SUBINTERVAL METADATA			
SPACECRAFT_ID	Yes	Yes	(Collection Level)
SENSOR_ID	Yes	Yes	(Collection Level)
CONTACT_PERIOD_START_TIME	No	No	
CONTACT_PERIOD_STOP_TIME	No	No	
WRS_PATH	No	Yes	(product specific)
STARTING_ROW	No	Yes	(product specific)
ENDING_ROW	No	Yes	(product specific)
SUBINTERVAL_START_TIME	Yes	Yes	RangeBeginningTime/...Date
SUBINTERVAL_STOP_TIME	Yes	Yes	RangeEndingTime/...Date
SUBINTERVAL_UL_CORNER_LAT		Yes	GringPoint(#1)
SUBINTERVAL_UL_CORNER_LON		Yes	GringPoint(#1)
SUBINTERVAL_UR_CORNER_LAT		Yes	GringPoint(#2)
SUBINTERVAL_UR_CORNER_LON		Yes	GringPoint(#2)
SUBINTERVAL_LL_CORNER_LAT		Yes	GringPoint(#4)
SUBINTERVAL_LL_CORNER_LON		Yes	GringPoint(#4)
SUBINTERVAL_LR_CORNER_LAT		Yes	GringPoint(#3)

Table C-1. Landsat-7 LOR LPS/IGS Metadata Attributes Mapped To ECS (2 of 5)

LPS Metadata File Attribute	ECS Parameter Checking	ECS Searchable	ECS Attribute
SUBINTERVAL_LR_CORNER_LON		Yes	GringPoint(#3)
*TOTAL_ETM_SCANS	No	viewable	(product specific)
PCD_START_TIME	No	viewable	(product specific)
PCD_STOP_TIME	No	viewable	(product specific)
TOTAL_PCD_MAJOR_FRAMES	No	No	
*ETM_LAST_ON_TIME	No	No	
*ETM_LAST_OFF_TIME	No	No	
UT1_CORRECTION	No	No	
BAND1_PRESENT	Yes	viewable	(product specific)
BAND2_PRESENT	Yes	viewable	(product specific)
BAND3_PRESENT	Yes	viewable	(product specific)
BAND4_PRESENT	Yes	viewable	(product specific)
BAND5_PRESENT	Yes	viewable	(product specific)
BAND6_PRESENT	Yes	viewable	(product specific)
BAND7_PRESENT	Yes	viewable	(product specific)
BAND8_PRESENT	Yes	viewable	(product specific)
TOTAL_WRS_SCENES	No	viewable	(product specific)
PARTIAL_WRS_SCENES	No	viewable	(product specific)
TOTAL_FILES	Yes	No	
BAND1_FILE_NAME	Yes	viewable	(product specific)
BAND2_FILE_NAME	Yes	viewable	(product specific)
BAND3_FILE_NAME	Yes	viewable	(product specific)
BAND4_FILE_NAME	Yes	viewable	(product specific)
BAND5_FILE_NAME	Yes	viewable	(product specific)
BAND6_FILE_NAME	Yes	viewable	(product specific)
BAND7_FILE_NAME	Yes	viewable	(product specific)
BAND8_FILE_1_NAME	Yes	viewable	(product specific)
BAND8_FILE_2_NAME	Yes	viewable	(product specific)
BAND8_FILE_3_NAME	Yes	viewable	(product specific)
MSCD_FILE_NAME	No	viewable	(product specific)
PCD_FILE_NAME	No	viewable	(product specific)
CAL_FILE_NAME	No	viewable	(product specific)
SCENE METADATA			
WRS_SCENE_NO	No	viewable	(product specific)

Table C-1. Landsat-7 L0R LPS/IGS Metadata Attributes Mapped To ECS (3 of 5)

LPS Metadata File Attribute	ECS Parameter Checking	ECS Searchable	ECS Attribute
FULL_OR_PARTIAL_SCENE	Yes	Yes	(product specific)
BROWSE_FILE_NAME	Yes	No	BrowsePointer
WRS_PATH	No	Yes	(product specific)
WRS_ROW	No	Yes	(product specific)
SCENE_CENTER_SCAN_NO	No	No	
SCENE_CENTER_SCAN_TIME	Yes	Yes	TimeofDay/CalendarDate
SCENE_CENTER_LAT	No	No	
SCENE_CENTER_LON	No	No	
HORIZONTAL_DISPLAY_SHIFT	No	No	
SCENE_UL_CORNER_LAT	Yes	Yes	GringPoint (#1)
SCENE_UL_CORNER_LON	Yes	Yes	GringPoint (#1)
SCENE_UR_CORNER_LAT	Yes	Yes	GringPoint (#2)
SCENE_UR_CORNER_LON	Yes	Yes	GringPoint (#2)
SCENE_LL_CORNER_LAT	Yes	Yes	GringPoint (#4)
SCENE_LL_CORNER_LON	Yes	Yes	GringPoint (#4)
SCENE_LR_CORNER_LAT	Yes	Yes	GringPoint (#3)
SCENE_LR_CORNER_LON	Yes	Yes	GringPoint (#3)
SCENE_CCA	Yes	Yes	(product specific)
UL_QUAD_CCA	No	Yes	(product specific)
UR_QUAD_CCA	No	Yes	(product specific)
LL_QUAD_CCA	No	Yes	(product specific)
LR_QUAD_CCA	No	Yes	(product specific)
ACCA_ALGORITHM_ID_VER	No	No	
SUN_AZIMUTH_ANGLE	No	Yes	(product specific)
SUN_ELEVATION_ANGLE	No	Yes	(product specific)
SCENE_BAND_1_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_2_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_3_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_4_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_5_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_6_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_7_PRESENT	Yes	viewable	(product specific)
SCENE_BAND_8_PRESENT	Yes	viewable	(product specific)
BAND1_GAIN	No	Yes	(product specific)
BAND2_GAIN	No	Yes	(product specific)

Table C-1. Landsat-7 L0R LPS/IGS Metadata Attributes Mapped To ECS (4 of 5)

LPS Metadata File Attribute	ECS Parameter Checking	ECS Searchable	ECS Attribute
BAND3_GAIN	No	Yes	(product specific)
BAND4_GAIN	No	Yes	(product specific)
BAND5_GAIN	No	Yes	(product specific)
BAND6_GAIN	No	Yes	(product specific)
BAND7_GAIN	No	Yes	(product specific)
BAND8_GAIN	No	Yes	(product specific)
BAND1_GAIN_CHANGE	No	Yes	(product specific)
BAND2_GAIN_CHANGE	No	Yes	(product specific)
BAND3_GAIN_CHANGE	No	Yes	(product specific)
BAND4_GAIN_CHANGE	No	Yes	(product specific)
BAND5_GAIN_CHANGE	No	Yes	(product specific)
BAND6_GAIN_CHANGE	No	Yes	(product specific)
BAND7_GAIN_CHANGE	No	Yes	(product specific)
BAND8_GAIN CHANGE	No	Yes	(product specific)
BAND1_SL_GAIN_CHANGE		viewable	(product specific)
BAND2_SL_GAIN_CHANGE		viewable	(product specific)
BAND3_SL_GAIN_CHANGE		viewable	(product specific)
BAND4_SL_GAIN_CHANGE		viewable	(product specific)
BAND5_SL_GAIN_CHANGE		viewable	(product specific)
BAND6_SL_GAIN_CHANGE		viewable	(product specific)
BAND7_SL_GAIN_CHANGE		viewable	(product specific)
BAND8_SL_GAIN_CHANGE		viewable	(product specific)
FULL_APERTURE_CAL_FLAG	No	Yes	(product specific)
DAY_NIGHT FLAG	Yes	Yes	(product specific)
**BROWSE_AVAILABLE_AT_STATION		Yes	(product specific)
**SCENE_QUALITY		Yes	(product specific)
***STATION_SCENE_ID		viewable	(product specific)
***ARCHIVE_SOURCE		viewable	(product specific)
Image Q&A Data			
CADUS/VCDUS_RECEIVED	No	No	
FLY_WHEEL_CADUS	No	No	
R-S_ERR_VCDUS	No	No	
BCH_CORRECTED_VCDUS	No	No	
BCH_UNCORRECTED_VCDUS	No	No	

Table C-1. Landsat-7 L0R LPS/IGS Metadata Attributes Mapped To ECS (5 of 5)

LPS Metadata File Attribute	ECS Parameter Checking	ECS Searchable	ECS Attribute
BIT_ERROR_RATE	No	No	
*ETM_TIMECODE_ERRORS	No	Yes	(product specific)
ENTIRELY_FILLED_SCANS	No	Yes	(product specific)
PARTIALLY_FILLED_SCANS	No	Yes	(product specific)
PCD Q&A Data			
PCD_WORDS_RECEIVED	No	No	
PCD_BYTE_VOTING_ERR	No	No	
TOTAL_PCD_MINOR_FRAMES	No	Yes	(product specific)
PCD_MINOR_FRAME_ERR	No	No	
FILLED_PCD_MINOR_FRAMES	No	Yes	(product specific)
FILLED_PCD_MAJOR_FRAMES	No	Yes	(product specific)
PROCESSED PCD Q&A Data			
TOTAL_ATTITUDE_POINTS	Yes	Yes	(product specific)
REJECTED_ATTITUDE_POINTS	Yes	Yes	(product specific)
MISSING_ATTITUDE_POINTS	Yes	Yes	(product specific)
TOTAL_EPHEMERIS_POINTS	Yes	Yes	(product specific)
REJECTED_EPHEMERIS_POINTS	Yes	Yes	(product specific)
MISSING_EPHEMERIS_POINTS	Yes	Yes	(product specific)

*Modification from LPS-DFCB, not yet formally approved.

**Attribute from L7/IGS-ICD only; applies to Landsat-7 as well as Landsat 1-5 metadata.

***Attribute from L7/IGS-ICD only; applies only to Landsat 1-5 metadata.

References: LPS-DFCB (11/14/96), L7/IGS-ICD (1/31/97).

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Abbreviations and Acronyms

B.0	Release B.0
B.1	Release B.1
CBI	Computer Based Interface
CCA	Cloud Cover Assessment
CCB	Configuration Control Board
CCR	Configuration Change Request
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CPF	Calibration Parameters File
CSMS	Communications and Systems Management Segment
CSS	Communication Subsystem
DAA	Data Availability Acknowledgment
DAAC	Distributed Active Archive Center
DAN	Data Availability Notice
DCE	Distributed Computing Environment
DCN	Document Change Notice
DDA	Data Delivery Acknowledgment
DDN	Data Delivery Notice
DFCB	Data Format Control Book
DID	Data Item Description
DRR	Data Retrieval Response
ECS	EOSDIS Core System
EDC	EROS Data Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System

EROS	Earth Resources Observation System
ESDIS	Earth Science Data and Information System
ESDT	Earth Science Data Types
ETM+	Enhanced Thematic Mapper Plus
FDDI	Fiber Distributed Data Interface
ftp	File Transfer Protocol
GB	Gigabyte
GCMD	Global Change Master Directory
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
HDF-EOS	Hierarchical Data Format - Earth Observing System
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
I/F	Interface
IAS	Image Assessment System
ICD	Interface Control Document
IDG	Infrastructure Development Group
IDR	Incremental Design Review
IGS	International Ground Station
IP	Internet Protocol
IRD	Interface Requirements Document
ISO	International Standards Organization
kftp	Kerberos File Transfer Protocol
LAN	Local Area Network
LPS	Landsat 7 Processing System
L7	Landsat 7 Project
MB	Megabyte, also Mbyte
Mbps	Megabits per second
MIC	Media Interface Connector

MMO	Mission Management Office
MOC	Mission Operations Center
MSCD	Mirror Scan Correction Data
NA	Not Applicable
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NSI	NASA Science Internet
ODL	Object Description Language
OSI	Open System Interconnect
PCD	Payload Correction Data
PAN	Production Acceptance Notification
PDR	Product Delivery Record
PDRD	Product Delivery Record Discrepancy
PMPDR	Physical Media Product Delivery Record
PVL	Parameter Value Language
RPC	remote procedure call
SDPF	Sensor Data Processing Facility
SDPS	Science Data Processing Segment
SDS	Scientific Data Sets
SDSRV	Science Data Server
SMO	System Management Office
TBD	To Be Determined
TBR	To Be Resolved
TBS	To Be Supplied
TCP	Transmission Control Protocol
TRMM	Tropical Rainfall Measuring Mission
USGS	U.S. Geological Survey
WRS	Worldwide Reference System

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